The Political Economy of Environmental Change and Justice in Neo-liberal India

A thesis submitted during 2015 to the University of Hyderabad in partial fulfilment of the award of a **Ph.D. degree** in School of Economics by

Kavya Michael

School of Economics
University of Hyderabad
(P.O) Central University, Gachibowli
Hyderabad – 500 046
India

DECLARATION

I **Kavya Michael** hereby declare that this thesis entitled **"The Political Economy of Environmental Change and Justice in Neo-liberal India"** submitted by me under the guidance and supervision of **Dr. G Vijay** and **Dr. V.Vamsicharan** is a bonafide research work which is also free from plagiarism. I also declare that it has not been submitted previously in part or in full to this University or any other University or Institution for the award of any degree or diploma. I hereby agree that my thesis can be deposited in Shodganga/INFLIBNET.

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//Countersigned//

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CHAPTER

1

Introduction

Contents

1.1 Environmental Change and Inequalities

The articulation of the environmental change in its most catastrophic form 'climate change' has forced economists, ecologists and policy makers to take into account the biophysical constraints of the planet. The dominant discourses essentially frame the debates around environmental change as a win-win solution, where economic growth still remains compatible with environmental protection, provided externalities are internalised and the onus is on technological fixes (Boyce, 2002, p. 4). Such a distinction ignores the entrenched patterns of socio-economic inequality that determines "causation, process and distribution associated with the environmental crisis" (Newell, 2005, p. 89). However in recent years a growing number of scholars articulate that access to a clean and safe environment is determined by existing patterns of socio-economic inequality (Adger, 2006; Boyce, 2002; Newell, 2005; B. C. Parks & Roberts, 2006; Wisner, Blaikie, Cannon, & Davis, 2003). The dissertation draws its inspiration from this approach and focuses on the linkages between inequalities and the environmental change in Indian context with a special focus on climate change. Environmental change is viewed here as a classic political economy problem centred on the question 'to whom' or in other words "who gains and looses as the change unfolds" (Boyce, 2002; B. C. Parks & Roberts, 2006).

The economic analysis of environmental change has largely focused on the aggregate costs and benefits ignoring its distributional implications (Hertel & Rosch, 2010). Literature on environmental justice reflects that rich people, in terms of assets and resources, have more to lose than poor people. Thus economic measures of environmental change are

biased towards the wealthy. However the vital assets drawn by poor during an ecological crisis are non-income assets like livestock, natural resource base, clean water, health care etc. which are often not accounted in the cost benefit analysis (B. Parks & Roberts, 2005). The nexus between inequality and enviornmental change both in terms of causation and its impacts have been largely ignored in this approach as a fringe area that diverts attention from the tangible effects of environmental change as well as adaptation and mitigation policies (Marino & Ribot, 2012). Adaptation and mitigation policies have largely focused on the *naturalness* or *bio-physicality* of the crisis ignoring its socio-economic construction (Marino & Ribot, 2012; Wisner et al., 2003). However Wisner et al. (2003) argues that the natural and human factors are so inextricably linked in various disaster situations such that they cannot be described as natural disasters alone. They describe this interface with the example of the Guatemala earthquake in 1976. The effects of this so-called natural disaster fell disproportionately on the slum dwellers, the poor and the marginalised residing in landslide-prone ravines and gorges leaving 23,000 Guatemalans dead, 77,000 injured, and 1.1 million homeless (B. Parks & Roberts, 2005). The socio-economic component of the disaster was so evident that it was labelled as a class-quake (Wisner et al., 2003). Environmental change presents similar scenarios, where socio-economic factors determine the distribution of costs and benefits associated with the crisis.

Far from what science and technology have adjudicated, enviornmental change or climate change is an issue of justice and human rights, a question of equity over time and space, and one that dangerously intersects race and class among others. Adger defines climate change as ,

"a burden imposed by past and present emitters on vulnerable people and systems"(Adger, 2010, p. 276). Thus "climate change is inequality both in terms of benefits of the carbon economy and in terms of the burdens imposed on the environment, the future people and the non-powerful everywhere" (ibid). The question of inequalities crop up at various levels when adaptation and mitigation activities are addressed. However studies have largely dealt with carbon space sharing at the inter-country levels, often ignoring the intra- country scenarios. Malone (2009) argues that studies on environmental change, vulnerability and resilience have largely dealt with the aggregate numbers alone and hardly integrates household's resource use and capabilities into the analysis. However it is of crucial importance to analyse the heterogeneous conditions of various groups of people at national and sub-national levels to truly capture the dynamics of environmental change in a country. In this context the dissertation examines the intersection between environmental change and inequalities among different socio-economic groups in neo-liberal India incorporating concepts like vulnerability, resilience and carbon space equity in the analysis. Climate change as a mainfestation of the environmental change is examined in the broader perspective of the resource guzzling neo-liberal growth scenario in India which has been socio-economically divisive and ecologically destructive.

Based on these premises, the dissertation seeks to examine the following hypothesis in the context of neo-liberal India.

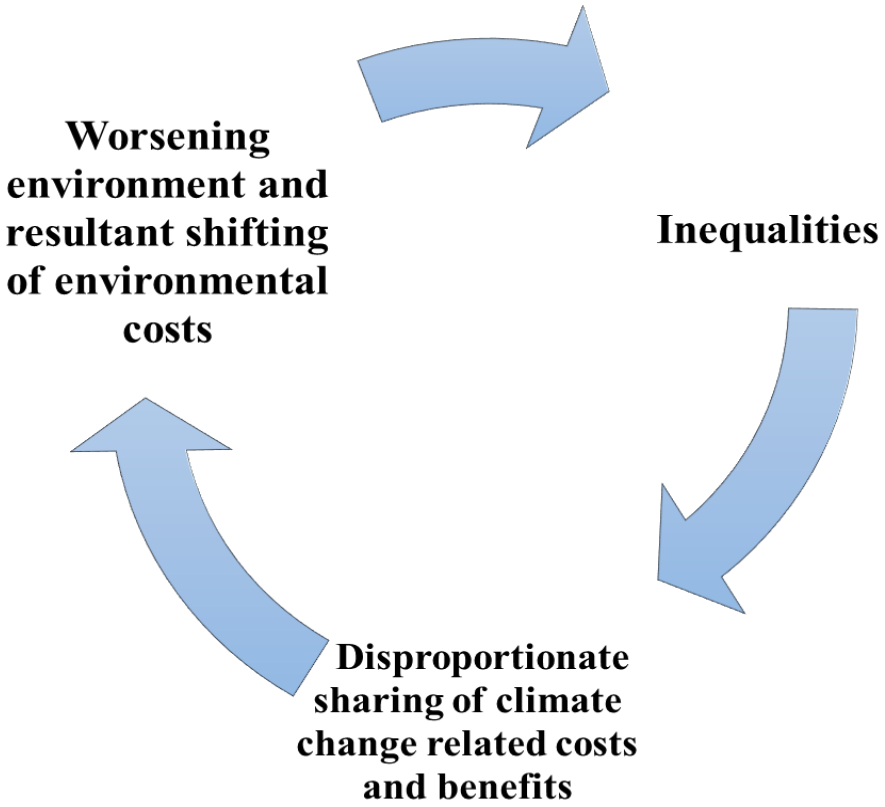

Figure 1.1: Schematic Representation of the research hypothesis

Socio-economic inequalities create an initial state of vulnerability or susceptibility to the changing climate. The hazards or risks of the global environmental change fall mostly on the poor and powerless who have a lighter carbon foot print. This violates their basic human rights for a healthy sustenance. The privileged and the powerful tend to get only the benefits from their economic activities, as they have the resources to shift the costs. As long as the rich and wealthy can shift the environmental costs of their economic activities to the poor and future generations, they

continue on the same track. This disproportionate sharing of risks worsens the environment further in a world where the measuring yard is ability to pay. Thus inequalities get aggravated forming a vicious circle.

1.2 Organization of the Chapters

The rest of the dissertation is organised as below. Based on existing literature Chapter 2 describes the vicious circle relations between inequality and environmental crisis and sets the theoretical framework for the subsequent chapters. Chapter 3 studies the distribution of carbon space among different socio-economic classes and examines how the benefits associated with a carbon intensive economy is distributed in post reform India. Chapter 4 focuses on the resilience to environmental change in post reform India among the same socio-economic classes and brings out the environmental justice dimension by comparing the resilience parameter with the respective classes' share of the carbon space. With a local level case study in Wayanad district, Kerala chapter 5 examines the multiple entanglements between inequality and environmental degradation, and depicts how the effects of environmental change are filtered through various socio-economic factors. Chapter 6 provides a summary of conclusions and outlines the possibilities for future research.

1.3 References

Adger, W. N. (2006). Vulnerability. *Global Environmental Change*, *16*(3), 268–281. http://doi.org/10.1016/j.gloenvcha.2006.02.006

Adger, W. N. (2010). Climate Change, Human Well-Being and Insecurity. *New Political Economy*, *15*(2), 275–292. http://doi.org/10.1080/13563460903290912

Boyce, J. K. (2002). *The Political Economy of the Environment*, Cheltenham, U.K. and Northampton, Edward Elgar Publishing.

Hertel, T. W., & Rosch, S. D. (2010). *Climate Change, Agriculture and Poverty* (No. WPS5468) (pp. 1–55). The World Bank. Retrieved from http://documents.worldbank.org/curated/en/2010/11/12962350/climate-change-agriculture-poverty.

Malone, E. L. (2009). Vulnerability and Resilience in the Face of Climate Change: Current Research and Needs for Population Information. *Battelle Memorial Institute,Washington*, *PNWD-4087*.

Marino, E., & Ribot, J. (2012). Special Issue Introduction: Adding Insult to Injury: Climate Change and the Inequities of Climate Intervention. *Global Environmental Change*, *22*(2), 323–328. http://doi.org/10.1016/j.gloenvcha.2012.03.001

Newell, P. (2005). Race, Class and the Global Politics of Environmental Inequality. *Global Environmental Politics*, *5*(3), 70–94. http://doi.org/10.1162/1526380054794835

Parks, B. C., & Roberts, J. T. (2006). Globalization, Vulnerability to Climate Change, and Perceived Injustice. *Society & Natural Resources*, *19*(4), 337–355. http://doi.org/10.1080/08941920500519255

Parks, B., & Roberts, J. T. (2005). *Understanding Vulnerability to Disasters: A Cross-National Analysis of 4,000 Climate-Related Disasters*. Retrieved from http://citation.allacademic.com/meta/p_mla_apa_research_citation/0/1/9/1/8/p19180_index.html.

Wisner, B., Blaikie, P., Cannon, T., & Davis, I. (2003). *At Risk: Natural Hazards, People's Vulnerability and Disasters* (2nd edition). London ; New York: Routledge.

CHAPTER

2

Inequality and the Global Environmental Crisis: Exploring the Nexus

Contents

2.1 Introduction

The planet today is at crossroads with unrestrained consumption and production transgressing planetary thresholds, jeopardising the generativity of the earth and the social structures that are dependent on it (Magdoff & Foster, 2011). Many environmentalists, scientists, business enterprises are offering solutions to the problem; green consumption, growth of capital markets, technocratic fixes etc. A closer examination indicates that most of these fixes elucidate an implicit optimism in the market mechanism and fails to "embed ecological challenges in tangible social realities" (Laurent, 2014, p.1). The mainstream approaches to the environmental crisis attempt a symptomatic treatment of the issue and often fail to trace the root causes. Understanding the causation is essential to make a deeper sense of the question, "who produces what kind of socio-ecological configurations for whom ?" (Heynen, Kaika & Swyngedouw 2006, p. 2).

The political economy of environmental degradation depicts a strong proportional and complex relation linking inequality and the environmental crisis. Magdoff & Foster (2011) argue that inequalities and environmental degradation are an integral conception of the capitalist system and hence it seems difficult to end. The neo-classical process of rationalisation involves artificial separation of different fields of human life and the narrow means to end rationality fails to consider the socio-economic and ecological dimensions in an integrated way (Lejano & Stokols, 2013). O'Neill argues that "environmental problems have their origins not in a failure to apply market norms rigorously enough, but in the very spread of the market mechanism into the environmental sphere

where they are completely inappropriate" (O'Neill, 2001, p. 1865). The fundamental question the critics of the neo-classical paradigm pose is, 'Can the structure, which generated the environmental crisis find fixes within itself'?

Beck (1992) articulates that the modern society is a risk society and the social production of wealth is often accompanied by social production of risk. Most often the havoc wreaked by the capitalist accumulation remains unknown and is even passed on to generations. Risks associated with production and consumption are distributed along lines of social risk positions that also coincide with the existing coalitions of inequalities and power differences. The diffusion and commercialisation of risks also create both winners, who profit from the risk, as well as losers, who bear the costs associated with it (Beck, 1992; Boyce, 2013). The mainstream fixes of the global environmental crisis attempted within the system also typically create a group of winners who benefits and capitalises from the climate crisis. Disaster capitalism as it is popularly called, precipitates disasters and employs these disasters as an opportunity to facilitate its expansion (Fletcher, 2012).

Climate change, the most catastrophic form of environmental change was also manufactured in a concoction of socio-economic inequalities generated by neo-liberal exploitation and unjust appropriation of global carbon space by the developed countries. Per contra the hazards associated with enviornmental change fluctuates rapidly among different social groups, falling disproportionately on the eco-system communities, the working classes and the marginalised reflecting highly nonlinear relationship between climate and outcomes (Ribot, 2009). Szasz & Meuser notes that the distributional implications of the environmental

crisis are juxtaposed on the existing coalitions of power and wealth generated by 'the normal workings of international political economy' (Szasz & Meuser, 1997, pp. 11–112). They depict "environmental inequalities as a necessary and inevitable facet of social inequalities embedded in the very fabric of modern societies" (ibid p.113). Thus it can be argued that socio-economic inequalities act as drivers of the environmental crisis, which in turn aggravates the existing inequities and disturbs the societal resilience. On the contrary environmental crisis exacerbates and also creates new forms of inequality triggering dynamic social consequences (Laurent, 2014). Human well-being is contingent up on natural capital and ecosystem services. Rogers et al. puts it like this, "Key components of human well-being are dependent on well-functioning ecosystems and biosphere. Conversely maintaining a healthy environment and making the transition to environmental sustainability requires human societies that function well"(Rogers et al., 2012, p. 3). Hence it is of crucial importance to understand the process that create and contribute to the existence and sustenance of environmental inequalities.

The current ecological and the economic crisis calls for a fresh perspective in economic thinking. It points to a complete failure of the traditional economic models obsessed with the religion of economic growth, the outcome of which is a society divided by socio-economic status and increasingly at war with the environment (Shrivastava & Kothari, 2012). Herein, the chapter locates provenances of current ecological crisis, within the structural inequalities and resultant power differentials implicit in the current mode of production and consumption. The multiple entanglements between inequality and

environmental degradation are examined to arrive at a comprehensive framework that depicts a vicious circle relationship where the former and the later mutually reinforce one another.

2.2 Synergy between Inequality and Sustainability

Debates and discussions about sustainability often tend to ignore the constant interaction and relations of the society and environment. Neumayer articulates the contradictory reality that scholarship on sustainability and human development have largely been disassociated even though "on a very fundamental level, human development is what sustainability proponents want to sustain and without sustainability, human development is not true human development" (Neumayer, 2010, p. 1). The question of sustainability was more often conceptualised as a matter of incorporating environment into economic decision making and very scant attention has been paid to the interlinkages of various dimensions of sustainability (Lehtonen, 2004). This is evident from the three pillar notion of sustainability in which it was perceived as a combination of social economic and environmental dimensions. However when the economic sphere is considered as a separate constituent detached from the social and environmental spheres, the model depicts fundamental flaws in the relationships between human societies and environment overlooking the synergies and trade-offs between them. (Lehtonen, 2004). Passet (1996) has proposed a new framework for sustainability, replacing the three pillars with three concentric circles where environment encircles the social dimension and the economic sphere constituting the innermost circle (as cited in Pelenc, 2010). This conveys the idea that social commands the economic sphere;

however it is subjected to the constraints of the biosphere.

Until recent years the social dimension of sustainability was not incorporated into discussions on environmental sustainability. The recent development in the field of sustainability research has been the incorporation of the capability approach proposed by Sen and Nussbaum into an environmental framework to capture the concept of a linked human bio physical system (Holland, 2008; Lehtonen, 2004; Pelenc, 2010; Pelenc, Lompo, Ballet, & Dubois, 2013; Schlosberg, 2012)[i]. Here sustainability is considered as a holistic concept encompassing social and ecological domains. "A marriage between the capability approach and the one based on environmental functions might hence provide ideas for analysing the environmental social interface" (Lehtonen, 2004, p. 204). Within the capabilities framework the effects of environmental crisis is conditioned through environmental entitlements that "refer to alternative sets of utilities derived from environmental goods and services over which social actors have legitimate effective command and which are instrumental in achieving wellbeing" (Leach, Mearns & Scoones, 1999, p. 233). These represent essential inputs for many capabilities which will be translated into constitutive determinants of well-being. Wisner et al. (2003) notes that nature presents humans a set of opportunities and potential hazards. However both the opportunities and hazards are unequally distributed i.e. access to resources and opportunities as well as exposure to hazards. Socio-economic inequality that determines the power relations affects the capability of various actors to draw their functionings from ecosystem services. Environmental inequalities arise as an outcome of socio-economic inequalities. They are subject to social construction and occur when different stakeholders struggle for access to

scarce resources within the political economy and the benefits and costs of these resources become distributed unequally (Pellow, 2000). Thus lack of access to critical components of natural capital especially for the ecosystem communities adversely affect their capability and well-being. As Neumayer argues "there exists a vicious circle relationship between inequality and unsustainability, where more of one will cause more of the other, in turn causing more of the former and so on" (Neumayer, 2011, p. 18). The following section explores the multiple entanglements between inequality and environmental quality. The two fold relationships by which inequalities lead to environmental degradation on one hand and the ways by which environmental crisis aggravates inequalities on ground is explored in detail below.

2.2.1 How do inequalities lead to environmental degradation and the resultant crisis?

The nexus between inequality and environmental degradation have been developed by the pioneering work of James K. Boyce. He has an extensive array of work which exclusively explores the nexus between inequality and environmental degradation. He underpins that the quality of natural environment is a reflection of how power and wealth are distributed (Boyce, 2002, 2013). The mainstream environmental thinkers and scholars juxtapose nature to humans where environment is often treated as a subset of the economy. Contrary to the popular notion Boyce argues that humans are a part of nature and not apart from it (Boyce, 2002, 2013). Environmental inequalities are an inevitable reflection of social inequalities embedded in the very fabric of a capitalist society. Hence it is of crucial importance to understand the dynamics of

allocating the risks and benefits of environmental degradation. Boyce argues that environmentally degrading economic activities need to be analysed through three basic questions (Boyce, 2013, p. 9).

i) Who benefits or in other words who pollutes?

Boyce argues that environmentally degrading activities typically creates winners who benefit from the activities and losers who bear the costs. The benefits from economic activities that generate environmental harm accrue to rich in the form of savings since they consume more. For the producers the benefits accrue in the form of profits from cost externalisation (Boyce, 2013, p. 14).

Inequalities in the form of income and class, among others, fuel luxurious consumption patterns. In societies with higher levels of inequality, consumption is a means to seek social certification and status (Wisman, 2010). Pickett and Wilkinson (2010) notes that consumption decisions are triggered by pressures of status competition, often intensified by higher levels of inequality. Bourdieu describes consumption as a way for the higher social classes to distinguish themselves from the lower social classes (as cited in Gram-Hanssen, 2004). Bourdieu distinguishes between three types of classes the bourgeoisie, petit bourgeoisie and the working class. According to him "the taste of the bourgeoisie is closely connected with appreciating what requires much money (economic capital) or a high cultural competence (cultural capital) which other classes do not possess. The taste of the petit bourgeoisie is defined by their trying to emulate the taste and norms of the bourgeoisie whereas the taste of the working class is defined by the choice of necessity (ibid)". Another feature of status competition is that

it biases consumption in favour of private goods as opposed to public ones such as quality of the environment.

A lot of popular approaches link poverty to environmental degradation where the poor degrade the environment in their quest to survive[ii]. Thus the capitalist fix for the problem calls for more economic growth to uplift the poor ,the benefits of which does not often trickle down but only leads to further degradation as humanity so far has not been able to isolate growth from its negative environmental effects (Wisman, 2010). Boyce depicts that if the amount of degradation per dollar were roughly the same for both groups, the richest 20 percent of the world's people would account for 140 times as much environmental degradation as the poorest 20 percent (Boyce, 2002, p. 6). Thus it can be argued that socio-economic inequality remains at the core of unsustainable consumption patterns that are energy and resource intensive (Rogers et al., 2012). The debates on sustainable consumption are dominated by powerful actors who still propagate the agenda that sustainability is compatible with increasing levels of consumption made possible by technological innovations. The absolute reductions in consumption patterns are often put off the table by powerful actors "who set the agendas and influence people's behaviour options and their impacts"(Fuchs et al., 2015). Thus the rationale for altered consumption patterns and lifestyle is often underplayed, which puts excessive pressure on the current resource base of the planet.

These trends are clearly visible in India's post reform growth scenario. The unjust appropriation of the carbon space in the country by an elite majority is empirically depicted in Chapter 3. The results of the study on direct household CO_2 emissions point out that all rural classes in the

country have emission rates below the average national per capita while the urban classes, especially the urban elites, have much higher levels than the average per-capita emissions of the country. The neo-liberal growth pattern in India was demand-deepening focusing on the wealthy and rich rather than exhibiting inclusive patterns of a demand-widening growth cutting across classes (Shrivastava & Kothari, 2012, p. 150). Inequality augments luxury consumption as is evident in India's post reform consumption patterns and most of the luxury goods like palatial homes or powerful automobiles have significant environmental impacts and resource demands.

ii) Who bears the cost?

The very existence of socio-economic inequalities renders as invisible certain groups of people. Schlosberg (2012) notes that mal-recognition promotes distributive injustices on the line of class, race, income, gender etc. When people are not recognised and their voices muted, they lose control over their own lives. Ribot (2009) notes that the impact of a similar climate hazard varies considerably among different groups of people at the same time. Thus vulnerability to environmental change inherently exists within the system or the communities who are exposed to it. Inherent vulnerability is an outcome of underlying political economy that determines assets and patterns of access (Brooks, 2003). Sen and Nussbaum develop this notion further through the capabilities approach which focuses not only on distributive inequities but also on capacity to lead functioning lives (Schlosberg, 2012). Wisner et al. (2003) notes that socio-economic exclusion and marginalisation renders access to livelihoods and resources that are insecure and unrewarding. Socio-

economic inequalities thus determines the inherent vulnerability of as system defined as "the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard, an extreme natural event or process" (ibid, p.11). The vulnerability associated with a natural hazard is produced when social vulnerability acts upon a triggering natural event and hence it becomes a determinant of bio physical vulnerability. Thus as Laurent (2014) notes "inequality acts as a multiplier of social damage caused by environmental shocks". By calculating a Climate Change Resilience Parameter for various social classes in India Chapter 4 reveals how socio-economic inequalities determines the extend of harm associated with a triggering natural event like climate change. The costs of the luxurious consumption patterns of the elites in the country are imposed on the marginalised and the poor.

iii) Why is it so? The politics of risk transfer

The history of risk distribution shows that like wealth risks also adhere to the class pattern; but only inversely wealth accumulates at the top, risk at the bottom (Beck, 1992). Newell (2005) notes that environmental bads are distributed along the rooted structures of socio-economic inequality along the lines of race, class, gender etc. The difference between the winners and the losers is attributed to power differentials. With greater inequality in the distribution of power those agents with more power are able to impose high external costs on those with less power, there by affecting the slice of the pollution pie as well as how it is sliced. Bullard depicts this clearly in his pioneering work on environmental justice "Dumping in the Dixie"(Bullard, 2000). For instance he shows that out

of 8 garbage incinerators in Houston 6 were in black neighbourhoods and one in a Hispanic neighbourhood. All the 5 landfills in the city were also located in black neighbourhoods. He contends that siting decisions merely followed the path of least resistance. "The unequal sharing of benefit and burden engenders feelings of unfair treatment and reinforces racial and class distinction" (Bullard, 2000, p. 88).

Boyce explains this with the help of "power-weighted social decision rule". "When the winners are powerful relative to the losers, more environmental degradation occurs than in the reverse situation"(Boyce, 2013, p. 38).

The greater the inequality of power, greater will be the social cost of environmental degradation. The process of risk transfer where the costs of environmental degradation are passed on to those who are not responsible for it is conditioned through differences in power often made possible through state intervention. Boyce depicts this as differences in purchasing power and political power, often correlated with one another[iii]. Both these forms of power render it impossible to arrive at the optimum level of pollution prescribed by the cost benefit analysis (ibid). Besides a clean and safe environment is not a pure public good and it is also possible to purchase private insulation from public bad using the clout of purchasing and political power.

Beck maintains that the "exponential growth of risks, impossibility of escaping them, political abstinence and the announcement and sale of private escape opportunities condition one another" (Beck, 1992, p. 36). The costs to the losers are simply ignored by the winners who pursue the activity as long as it remains privately beneficial for them to do so, i.e. as

long as they are not held accountable. Thus as Laurent (2014) notes inequality renders the rich unaccountable for their actions by creating conducive conditions for transferring the associated environmental damages to the poor and the powerless.

By bringing the distribution of carbon space and climate change resilience of different social classes in the country Chapter 4 also lends empirical evidence to the process of risk transfer where the impacts of environmental change falls on the least polluters in the country who also happen to be the marginalised and the powerless groups. The elites in the country manage to corner the benefits of state policies as was evidenced by declining public investment in agriculture and decline in the consumption share of rural agrarian classes and ample subsidies for agriculturists and rural elites (Vakulabharanam, 2012). Gadgil & Guha (1995) argues that this process of risk transfer has been made possible through the actions of the neo -liberal state in India who helps enhance the resource base of the 'omnivores' in the country even if it is at the expense of the eco-system people [iv].

2.2.2 Environmental Crisis and Inequalities

The link between environmental crisis and inequalities can be examined through the notion of strong sustainability which highlights the limited substitutability of natural capital for human existence and well-being, in a unique way such that it cannot be replaced by any other forms of capital (Ekins et al. 2003; Pelenc et al., 2013). Ekins et al. (2003) depicts these contributions in the form of resources provided by the ecosystem components, life support and regulation functions that maintain stability and resilience, as well as a sink for absorption of waste from human

activities. This leads to a concept of Critical Natural Capital that performs essential eco-system services to present and future wellbeing characterised by its irreversibility when thresholds are crossed provoking an ecological crisis (Pelenc, 2010). Brand (2009) notes that nature constitutes an integral part of the socio-cultural identity for many indigenous communities and social groups often entwined with their food and livelihood security. The environmental crisis like climate change disproportionately affects those communities who are directly dependant on eco-system services.

Hence erosion of eco-system services through its unsustainable use and degradation could lead to loss of capabilities for present generations and to some extend future generations. Thus environmental crisis primarily impairs the socio-ecological resilience of resource dependent communities. The welfare impact of erosion of eco-system services as an outcome of the environmental crisis is mediated through existing power relations where certain actors can mobilise certain endowments to make effective use of some others. (e.g.when rainfall decreases the rich farmers can invest capital and artificially irrigate their land through sprinklers etc.) Anu Kapur opinions that "Vulnerability is like a leak that allows forces, agents and processes to break in and thus impact" (Kapur, 2008, p.196). Environmental degradation or environmental crisis acts on the inherent vulnerability in a place, community or social group there-by acting as a crisis catalyst. "Any weakness is susceptible to exploitation. Natural forces can roam and rein free in a land where people are disadvantaged" (Kapur, 2008, p. 205).

Boyce (2013) argues that unequal vulnerabilities before and during a disaster often continue to play out in the period of disaster. After a

disaster they have great difficulty in recovering from disasters due to less insurance, lower incomes, fewer savings, unemployment, access to resources etc.(ibid). When evaluated through the cost benefit analysis lens, public policies place a lower priority on less valuable people and their assets (Boyce, 2002, 2013, 2014). Thus the resilience capacity of any social group or population is not determined just by external factors such as disasters or climate shocks but the regenerative capacity of a social or an ecological system as defined by socio-economic and political conditions (Ribot, 2009).

Adaptation and mitigation strategies following an environmental crisis places more value on the assets of the rich and powerful. When the costs of climate protection are measured by "willingness to pay" the whole issue burns down to a question of haves and have not's. Willingness to pay is contingent on ability to pay and hence the preferences revealed in the market need not necessarily depict the preferences for environmental quality. Boyce (2014) illustrates this with a striking example. He proposes a thought experiment where climate change will cause world incomes to fall by 25%. For the majority of the marginalised and the poor who live on one dollar a day it leads to a loss of mere 25 cents. However this small amount entails a question of survival for them. On the other hand a real estate baron with an income of about $2000 per day will lose 500 $ daily. In monetary terms the loss is much higher for the baron and thus traditional economic models will be biased towards protecting the baron's interest because it rests on logic of economic efficiency that counts each dollar equally. Boyce (2014) argues that this attitude was brutally visible in the 1992 memorandum signed by Lawrence Summers, the then Chief Economist of the World Bank who stated that "the

economic logic of dumping a load of toxic waste in the lowest-wage country is impeccable and we should face up to that".

The ecological crisis also exacerbates inequalities on ground through the emergence of new market fixes for the same. Termed as disaster capitalism by Naomi Klein, she defines it as, "orchestrated raids on the public sphere in the wake of catastrophic events combined with treatment of disasters as exciting market opportunities" (Klein, 2007). Neo-liberal policies seek to harness crises as opportunities for continued economic expansion. The neo-liberal fixes for the ecological crisis includes commodification of nature, privatisation of state controlled resources, restricting participation of local communities by transferring governance to non-state actors, increased exploitation of dwindling natural resource for short term profits etc. (Naidu & Panayiotis, 2010). Termed as accumulation by dispossession by Harvey, solution to the environmental crisis promotes exclusion by alienating the minority of their rights to use nature (ibid). Beck (1992) argues that in the risk society, risks themselves becomes big business opportunities. As the environmental crisis enfolds we see these patterns emerging. For e.g. under the name of Clean Development Mechanism we see the developed countries displacing or transferring their emissions to poorer societies by paying the latter to reduce their own emissions. Neo- liberal capitalism has succeeded in commodifying not just environment but also environmental concern in the form of green economy, green consumerism, and carbon markets to address climate change among others. Thus as Laurent argues contemporary ecological crisis poses a severe threat to social justice through the rise of environmental inequalities (Laurent, 2014). Through a case study in Wayanad district,

Kerala Chapter 5 typically examines the effects of ecological crisis on different groups of people with a special focus on the indigenous tribes. As argued there, Wayanad is an ideal representation of the multiple socio-ecological crises confronting rural India following the neo-liberalisation of nature. It clearly depicts the circular causation where inequalities become the cause and consequence of environmental degradation.

2.2.3 Synthesis

Figure 2.1 summarises the main arguments discussed. Socio-economic inequalities trigger luxurious consumption patterns putting excessive pressure on the dwindling resource base of the planet as well as unjust appropriation of the ecological space by an elite majority. However the costs of environmental degradation are transferred to the marginalised and the vulnerable leading to uneven distribution of environmental 'bads'. Unequal distribution of environmental harms increases the ecological irresponsibility of the rich as they are often shielded from the harmful effects of their actions. Hence they continue on the same trajectory putting pressure on the earth's carrying capacity leading to the environmental crisis. On the other hand the bio-physical vulnerabilities associated with environmental crisis as well as adaptation policies ensure that hazards associated with the crisis are unequally distributed. The environmental crisis often results in the erosion of critical eco-system services for the resource dependant and rural agrarian communities. Losing command and access over the environmental resources previously enjoyed creates fragile livelihoods that are vulnerable to shocks. This impairs their capability to lead functioning lives and the

result is marginalisation and aggravated inequalities.

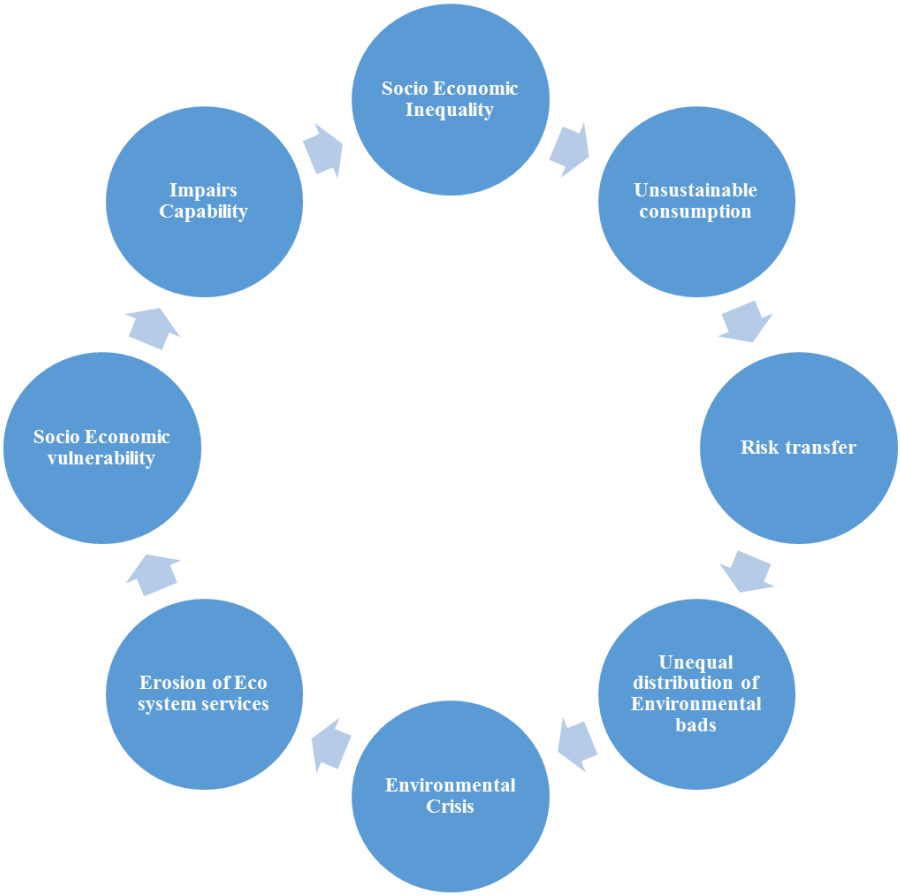

Figure 2.1: Diagrammatic representation of the nexus between inequality and environmental degradation

2.3 Conclusion

The nexus between socio-economic inequalities and environmental degradation addressed in this chapter outlines that environmental dimension of sustainability can be attained only by addressing the socio-economic dimension of sustainability (Rogers, 2014). Bookchin (1996)

articulates that man's relationship with nature reflects realities of social domination in the form of hierarchies, class, and race among others. Boyce argues that unequal societies generate more environmental harm. "When disparities are great those at the top of the political and economic ladder can more easily pollute but when they are small those at the bottom are better able to defend themselves" (Boyce, 2002, p. 1). Environmental problems are a reflection of existing socio-economic inequalities. Thus it is of critical importance to reform our social systems so that it can buttress the natural environment from degradation and the resultant crisis.

The current development model has reduced the sustainability debate to a mere question of substitutability between manmade and natural capital and ignores the complex interplay between inequalities and power relations. Marshall (2015) articulates that understanding power relations embedded in the current socio-economic system is critical to develop models of resistance that can potentially avert the planetary crisis. In an unequal society disparities in social status drives excess consumption through status competition, while disparities in power leads to diversion of political, economic and environmental resources to the elites, and promotes environmental degradation through a disproportionate sharing of the costs of environmentally degrading economic activities. Moreover vulnerability to any environmental crisis falls on the people who are dependent on primary resources or whose livelihoods are closely associated with the environment. Natural capital is a critical input for many capabilities that are instrumental in achieving well-being. Wisner et al. (2003) notes that nature also constitutes a part of resources that are allocated by social processes, which again determines the conditions

under which people become more or less vulnerable to hazards. When bio-physical changes enter a socio -economically stratified world it poses greater threat to people who live on 'the threshold of disasters" (Marino & Ribot, 2012; Wisner et al., 2003).

The world today is characterised by increasing inequality within and between countries and a calamitous transformation of its climate and life support systems by a process of a run-away global warming (Magdoff & Foster, 2011). However academicians and policy makers often ignore the multiple entanglements between the two. Analysing the integral links between inequality and environmental change helps understand the true meaning of vulnerability and resilience and offers a framework for action targeted at a more fundamental level. Peeters, Dirix, & Sterckx, 2013 argues that when human development is defined as expansion of people's capabilities, environmental change clearly violates the basic human rights condition. Hence it is of crucial importance to challenge the current economic growth model that feeds on entrenched patterns of inequality exacerbating the socio- economic and environmental crisis.

2.4 Endnotes

[i] Pelenc (2010) argues that the integration of capabilities approach with the concept of critical natural capital helps to analyze fundamental questions involving access to eco system services. Holland (2008, p. 238) notes that sustainable environment is a 'meta capability' which facilitates all the others. While eco system services define essential input for many capabilities he also argues that access to natural capital and its quality is defined by real freedoms people enjoy which is contingent upon inequalities and power differences. Applying capabilities approach to eco system services "allows a better understanding for what and for whom" natural capital is critical. In other words this approach highlights the integral links between socio-economic and environmental inequalities and thus can help design effective policies that can provide equitable solutions for a sustainable world.

[ii] This aspect is discussed in detail in Chapter 3.

[iii] Cost benefit analysis is based on the rule that environmental degradation is pursued up to the point where marginal impact on the society is optimum (Boyce, 2002, p. 34). However Boyce argues that the theory itself is problematic as it does not throw light on who gets the benefit and who bears the cost (ibid).

[iv] Gadgil & Guha (1995) defines omnivores as elites in India who claim everything produced in the country with significant power to influence state policy.

2.5 References

Beck, U. (1992). *Risk Society: Towards a New Modernity* (1 edition), London ; Newbury Park, SAGE Publications Ltd.

Bookchin, M. (1996). *Toward an Ecological Society*, Montréal , Buffalo Black Rose Books.

Boyce, J. K. (2002). *The Political Economy of the Environment*, Cheltenham, U.K. and Northampton, Edward Elgar Publishing.

Boyce, J. K. (2013). *Economics, the Environment and Our Common Wealth*, Cheltenham, U.K , Edward Elgar Publishing.

Boyce, J. K. (2014, December). As The Climate Changes, Adaptation Becomes Imperative, *Scholars Strategy Network*. Retrieved from http://www.scholarsstrategynetwork.org/content/climate-changes-adaptation-becomes-imperative.

Brand, F. (2009). Critical Natural Capital Revisited: Ecological Resilience and Sustainable Development, *Ecological Economics*, *68*(3), 605–612. http://doi.org/10.1016/j.ecolecon.2008.09.013.

Brooks, N. (2003). Vulnerability, Risk and Adaptation: A Conceptual Framework, *Tyndall Centre for Climate Change Research Working Paper*, *38*, 1–16.

Bullard, R. D. (2000). Dumping in Dixie: Race, Class, And Environmental Quality, Third Edition, Boulder, Colorado, Westview Press.

Ekins, P., Simon, S., Deutsch, L., Folke, C., & De Groot, R. (2003). A Framework for the Practical Application of the Concepts of Critical Natural Capital and Strong Sustainability, *Ecological Economics*, *44*(2–3), 165–185. http://doi.org/10.1016/S0921-8009(02)00272-0.

Fletcher, R. (2012). Capitalizing on Chaos: Climate Change and Disaster Capitalism, *Ephemera*, *12*, 97–112.

Fuchs, D., Di Giulio, A., Glaab, K., Lorek, S., Maniates, M., Princen, T., & Røpke, I. (2015). Power: The Missing Element in Sustainable Consumption and Absolute Reductions Research and Action, *Journal of Cleaner Production*, http://doi.org/10.1016/j.jclepro.2015.02.006.

Gadgil, M., & Guha, R. (1995). Ecology and Equity: The Use and Abuse of Nature in Contemporary India, Penguin Books India, New Delhi.

Gram-Hanssen, K. (2004). Domestic Electricity Consumption–Consumers and Appliances, *The Ecological Economics of Consumption*, 132–150.

Heynen, N., Kaika, M., & Swyngedouw, E. (2006). Urban Political Ecology, pg.1–20 in *The Nature of Cities: Urban Political Ecology and the Politics of Urban Metabolism*, Routledge, London.

Holland, B. (2008). Justice and the Environment in Nussbaum's "Capabilities Approach" Why Sustainable Ecological Capacity Is a Meta-Capability?,*Political Research Quarterly*, *61*(2), 319–332. http://doi.org/10.1177/1065912907306471.

Kapur, A. (2008). *Vulnerable India: A Geographical Study of Disasters.* , Shimla, SAGE Publications India.

Klein, N. (2007). Disaster Capitalism, *Harper's Magazine*. Retrieved from http://www.angelfire.com/il/photojerk/klein.pdf.

Laurent, E., (2013), Inequality as Pollution, Pollution as Inequality. The Social-Ecological nexus , Working Paper of the Stanford Center on Poverty and Inequality. Retrieved from https://ideas.repec.org/p/spo/wpmain/infohdl2441f6h8764enu2lskk9p4a36i6c0.html.

Leach, M., Mearns, R., & Scoones, I. (1999). Environmental Entitlements: Dynamics and Institutions in community-based natural resource management, *World Development*, *27*(2), 225–247.

Lehtonen, M. (2004). The Environmental–Social interface of Sustainable Development: Capabilities, Social capital, Institutions, *Ecological Economics*, *49*(2), 199–214, http://doi.org/10.1016/j.ecolecon.2004.03.019.

Lejano, R. P., & Stokols, D. (2013). Social Ecology, Sustainability, and Economics, *Ecological Economics*, *89*, 1–6.

Magdoff, F., & Foster, J. B. (2011). *What Every Environmentalist Needs to Know About*

Capitalism, New York: Monthly Review Press.

Marino, E., & Ribot, J. (2012). Special Issue Introduction: Adding insult to Injury: Climate Change and the Inequities of Climate Intervention, *Global Environmental Change*, *22*(2), 323–328.

Naidu, S. C., & Panayiotis, T. M. (2010). Primary Accumulation, Capitalist Nature and Sustainability, *Economic and Political Weekly*, *29*. Retrieved from https://www.academia.edu/4117078/Primary_Accumulation_Capitalist_Nature_and_Sustainability.

Neumayer, E. (2010). Human Development and Sustainability, Human Development Report Office (HDRO), *Human Development Research Papers (2009 to Present)*, 13(HDRP-2010-05)United Nations Development Programme (UNDP). http://doi.org/10.2139/ssrn.1711867.

Neumayer, E. (2011). Sustainability and Inequality in Human Development, *UNDP-HDRO Occasional Papers*, (2011/4). Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2351453.

Newell, P. (2005). Race, Class and the Global Politics of Environmental Inequality, *Global Environmental Politics*, *5*(3), 70–94, http://doi.org/10.1162/1526380054794835.

O'Neill, J. (2001). Markets and the Environment, *Economic and Political Weekly*, *36*(21).

Peeters, W., Dirix, J., & Sterckx, S. (2013). Putting Sustainability into Sustainable Human Development, *Journal of Human Development and Capabilities*, *14*(1), 58–76, http://doi.org/10.1080/19452829.2012.748019.

Pelenc, J. (2010). Crossing Sen's Capability Approach with Critical Natural Capital Theory: Towards a New Perspective to Reconcile Human Development

and Nature Conservation goals in *Bienal conference of the International society of ecological economics Advancing sustainability in time of crisis*. Retrieved from https://hal.archives-ouvertes.fr/hal-00732613/.

Pelenc, J., Lompo, M. K., Ballet, J., & Dubois, J.-L. (2013). Sustainable Human Development and the Capability Approach: Integrating Environment, Responsibility and Collective Agency, *Journal of Human Development and Capabilities*, *14*(1), 77–94. http://doi.org/10.1080/19452829.2012.747491.

Pellow, D. N. (2000). Environmental Inequality Formation Toward a Theory of Environmental Injustice, *American Behavioral Scientist*, *43*(4), 581–601, http://doi.org/10.1177/0002764200043004004.

Pickett, K., & Wilkinson, R. (2010). *The Spirit Level: Why Equality is Better for Everyone*, London: Penguin.

Ribot, J. C. (2009). Vulnerability does not just Fall from the Sky: Toward Multi-scale Pro-poor Climate Policy in R. Mearns & A. Norton (Eds.), *Social Dimensions of Climate Change: Equity and Vulnerability in a Warming World*, Washington, DC: The World Bank. Retrieved from http://www.icarus.info/wp-content/uploads/2009/10/Ribot-Vulnerability-Final-Draft-for-Distribution.pdf.

Rogers, D. S. (2014). Socioeconomic Equity and Sustainability in B. Freedman (Ed.), *Global Environmental Change,* 933–941, Springer Netherlands. Retrieved from http://link.springer.com/referenceworkentry/10.1007/978-94-007-5784-4_62.

Rogers, D. S., Duraiappah, A. K., Antons, D. C., Munoz, P., Bai, X., Fragkias, M., & Gutscher, H. (2012). A Vision for Human Well-Being: Transition to

Social Sustainability, *Current Opinion in Environmental Sustainability*, *4*(1), 61–73.

Schlosberg, D. (2012). Climate Justice and Capabilities: A Framework for Adaptation Policy, *Ethics & International Affairs*, *26*(04), 445–461. http://doi.org/10.1017/S0892679412000615.

Shrivastava, A., & Kothari, A. (2012). *Churning the earth: the making of global India*, New Delhi ; New York: Penguin.

Szasz, A., & Meuser, M. (1997). Environmental Inequalities: Literature Review and Proposals for New Directions in Research and Theory, *Current Sociology*, *45*(3), 99–120, http://doi.org/10.1177/001139297045003006.

Marshall, S.B (2015), The Global Ecological Crisis and Weaving New Power Relationships, Transnational Institute. Retrieved June 12, 2015, from http://www.tni.org/briefing/global-ecological-crisis-and-weaving-new-power-relationships.

Wisman, J. (2010). *Inequality, Social Respectability, Political Power and Environmental Devastation,* Working Paper No. 2010-09, American University, Department of Economics. Retrieved from http://econpapers.repec.org/paper/amuwpaper/2010-09.html.

Wisner, B., Blaikie, P., Cannon, T., & Davis, I. (2003). *At Risk: Natural Hazards, People's Vulnerability and Disasters* (2nd edition), London ; New York: Routledge.

CHAPTER

3

Class and Climate Injustice in Post Reform India

Contents

An abridged version of the chapter has also been published in Climate and Development journal by Routledge

3.1 Introduction

Debates on access and entitlement to global atmospheric commons are mostly dominated by inequalities among countries sharing the global carbon space, in the process ignoring the inequalities among different groups, within countries. However, there is also a growing quantum of literature which blames the poor and the powerless sections for polluting the environment in their struggle to survive (e.g. Brundtland 1987, UNDP 1990, Jalal 1993 and Rozelle, Huang & Zhang 1997). Hollander (2003) argues that the poor people in their ignorance plunder the resources, pollute the environment and over-crowd their habitats. He visualises affluence as a key ingredient for sustainable environments. In the Indian context, studies on emission profiles have so far been production oriented, and have largely ignored inter-group differences in emissions (for exceptions, see below) (Michael & Vakulabharanam, 2015). In this chapter, we establish using household consumption surveys that the elites in India (as may be the case in other countries too) are the major polluters both in an absolute sense as well as in per capita terms, while the working groups tend to suffer from acute energy poverty, and are the least polluters (ibid). During the last two decades of reforms in India, it is the urban elites that have contributed almost fully to the increase in the inequality of emissions in the household sector.

The literature on household level study of emissions in the country is quite scarce (ibid, p.1). Parikh and Gokarn (1993) have examined CO_2 emissions by income classes based on input output and social accounting matrices. The analysis concludes that in terms of lifestyle differences across income classes, the urban top 10% accounts for emissions of 3416

kg per capita per year while rural bottom 10% class accounts for only 141 kg per capita per year taking into account both direct and implicit household carbon dioxide emissions (Parikh & Gokarn, 1993; Parikh, Panda, Kumar & Singh, 2009). Another report by Green Peace India also highlights substantial increase in carbon dioxide emissions with rising incomes (Ananthapadmanabhan, Srinivas & Gopal, 2007). The report highlights the need for implementing a common but differentiated responsibility within the country. Mukhopadhyay (2008) observes that higher and middle income groups generated more air pollution in the country compared to other classes. However income is one of the characteristics of a socio economic class. The concept of a social class used in this study in terms of self identification of economic status and power captures the variations in values and life-styles of consumers, both of which significantly determine the emission patterns. A deeper conception of social class is essential to make sense of the political economy of potential environmental conflicts.

From an initial techno-centric conceptualization, enviornmental change is being increasingly recognised as an issue of justice and human rights, a question of equity over time and space, one that dangerously intersects with class, race, ethnicity, nationality and gender (Blaikie, Cannon, Davis & Wisner, 2003; Boyce, 2008). Majority of the global environmental considerations are guided by efficiency and valuation principles based on monetary costs, which are indifferent between the rich and the poor. This cost-based principle for efficient resource allocation can be contrasted to a rights based approach that is founded on the premise that countries and individuals have equal rights to a clean and safe environment (Michael & Vakulabharanam, 2015).

Popularly known as the human rights or justice based approach to environmental change this approach condemns as unjust a situation in which some (who are advantaged) expose others to risks that threatens the latter's basic survival[i]. It adopts a discriminative approach to the impacts of enviormental change from a purely human rights perspective and requires reframing of issues that surround the costs of adaptation and mitigation (Caney, 2010)[ii]. Our intervention in this chapter draws inspiration from this approach.

In this chapter, we address the questions of equity and carbon space sharing within India by focusing on the distribution of emissions across different classes as they have evolved after India embarked on market-friendly economic reforms in the early 1990s. We argue that the strong elite bias in the Indian growth process may result in unpredictable dynamic increases in the overall emissions in the coming decades. Our results underline the co-existence of climate and energy injustice within the country and the need for urgent policy action.

The rest of the chapter is organised as follows. Section 2 presents a macro profile of the Indian emission scenario. Section 3 discusses the methodologies employed in the study and the data sources. Section 4 delves into classes and inequality in emissions with respect to different consumption items of households. Section 5 arrives at a comprehensive climate injustice model for the India economy based on a Climate Injustice Parameter (CIP) and a Gini Coefficient of Emission. Section 6 discusses the results and concludes.

3.2 India's Emission Scenario

Recent estimates suggest that the use of energy accounts for 60 % of the greenhouse gas emissions in India (Reddy & Sreenivas 2009). Energy statistics for India state that the primary energy demand in India rose by 68% over the 1990–2005 period with *coal* meeting 38% of the primary energy requirements (Planning Commission, 2006). However non-commercial sources of energy such as *biomass* and *cowdung* account for about 28% of the total primary energy consumption which is mainly attributed to the household sector (ibid). There have been several studies on the emission scenario of the country. However, the official estimates of India's Greenhouse Gas (GHG) emissions are available only for the years 1994 and 2007. The per capita CO_2 emissions are 0.9 tons of CO_2 in 1994 and 1.3 tons of CO_2 in 2007 (INCCA, 2010; NATCOM 2004**)**. The distribution of CO_2 emissions in different sectors as per the report, *India's Green House Gas Emissions Report 2007* (INCCA, 2010) is given below.

Table 3.1: CO_2 Emissions in 000 tons from energy sector in 2007

	CO_2 (000 tons)
GRAND TOTAL	1497029.200
Energy	992836.300
Electricity Generation	715829.800
Other energy industries	33787.500
Transport	138858.000
Residential	69427.000
Commercial/Institutional	1657.000
Agriculture/Fisheries	33277.00

From Table 3.1 we can see that the total CO_2 emission from India in 2007 was equal to 1,497,029.2 thousand tons. Of this, the energy sector emitted 99,283,630 thousand tons. The CO_2 emissions from residential sector was 69,427 thousand tons which accounted for 6.9% of emissions from the energy sector[iii]. The report recognises residential sector as one of the largest consumers of fuel, outside the energy industries. However, there is no further disaggregated study of the residential sector. An analysis of household level emissions is important to enumerate the distributional implications of environmental change. The household sector is one of the largest users of energy in India, accounting for about 30 % of final energy consumption (Reddy et al 2009, p.13). During the past few decades, India has experienced many changes in its energy consumption patterns, both in quantitative and qualitative terms (ibid). This is indeed due to rising incomes, changing lifestyle and consumption

patterns, advent of household appliances, increased number of vehicles and so forth. However despite the increased energy consumption in urban areas, severe energy injustice arises partly because of the patterns of energy consumption in the rural areas of the country. A comparison of results obtained from 1993-94 to 2009-10 shows that firewood remains the dominant source of primary energy supply in rural areas whereas the urban households have more access to cooking gas cylinders for cooking and electricity for lighting (NSSO, 2012 p.15).

Percentage of households depending on firewood remained at 76.3% in 2009-10 – a drop of only 2 percentage points since 1993-94 – even though the percentage using LPG has increased from about 2% to 11.5% over the same period (ibid). The dependence on firewood for cooking in urban areas has fallen from about 30% to 17.5% between 1993-94 and 2009-10, while the dependence on kerosene has plunged from 23.2% to 6.5% during the same period. At the same time, the percentage of urban households using gas cylinders has more than doubled from under 30% to 64.5% showing a steady move towards cleaner and more sustainable energy sources in urban areas (ibid).

3.3 Data and Methodology

The data source used for our analysis is the Indian National Sample Survey Household Consumer Expenditure Data, rounds 50(1993-1994), 61(2004-2005) and 66(2009-2010). In the 50th round, 115,354 households were selected in the sample, out of which 69,206 are from rural area, and 46,148 are from the urban area. In the 61st round 124,643 households were selected out of which 79,297 are in rural areas and 45346 are in urban areas. In the 66th round 100,855 households were

selected out of which 59,119 are in rural areas while 41,736 are in urban areas. However studies have found that NSSO (National Sample Survey Organization) data are unable to capture the consumption patterns of the very rich and hence the emissions of the rich in this analysis may be underestimated (Chakravarty et al., 2012).

The basic unit of analysis is the household for which monthly consumption data is available. The whole analysis is done within a class framework adapted from Vakulabaranam (2010, p.67-76). Given below is a brief description of the class framework. "While in popular parlance class is defined in income terms, for many social scientists this is not a satisfactory device since it uses the outcome, i.e. income, of various social dynamics to define the class" (ibid).

3.3.1 Class Framework

The class structure used here is an adaptation of the Marxian class structure defined at the site of production. According to this schema six classes are identified for India with four classes in rural and two in urban India. The four classes in rural India comprise of rural elite (both big and middle farmers and non-agricultural elites that include owners, moneylenders, professionals and absentee landlords), rural non-agricultural workers, small peasants and agricultural workers. In the urban areas, only two classes are defined, the elite (owners, managers and professionals) and the workers (other than professionals). For the rural sample, classes are defined using occupational data for non agricultural population and land as the basis for agricultural population. Using the NSS survey question that identifies agriculture as the main occupation of a household as a base, those householdsthat own more than ten acres of

land are defined as rich farmers. Those who own between five and ten acres of land are defined as middle farmers. Those who own between two and five are designated as small farmers. Marginal farmers are those who own less than two acres of land while those who own no land but depend on agriculture as their primary source of livelihood and define themselves as workers are defined as the agricultural workers.

Table 3.2: Class wise Population ratios for NSS 66th round

Class	**Population (%)**
Agricultural Worker	18.290
Small Peasant	17.960
Non Agricultural Worker	14.860
Rural Elite	21.830
Urban Worker	17.270
Urban Elite	9.760

Relevance of Class to an Emissions Framework

As mentioned in the above section quite a few studies calculate household level emissions on the basis of income. So why is a different class framework necessary? First, since the emissions discussed here are due to consumption, it is relevant to look into the social origins of consumption based environmental problems. Existing literature on the relevance of social class in consumption theory is quite vast.

Consumption decisions are often not just income based but also dependent on social and institutional settings of different actors, their power positions, social relations and so forth (Bourdieu 1984, Cogoy 1999). Emissions correspond rather closely to social class (Lutzenhiser et al 1993, Kuehn 1998) The class distinctions based on occupational and social distinctions therefore are very different from income based distinctions.

The class structure framework used in this chapter utilises the NSSO household level data to include indicators of social status like land ownership and occupational status. The chapter focuses on two forms of environmental injustice in the country: climate injustice and energy injustice. The existence of energy injustice in the country also has origins in the class structure, defined in a nuanced fashion. For instance, some of the rural classes in our study like the agricultural laborers, non-agricultural workers and small peasants are excluded from access to basic energy services not exclusively due to their low income, but also because of their social position, caste status, and their spatial location. Given these considerations, we believe that an emissions analysis based on class structure is definitely preferable over the conventional income based approaches.

3.3.2 Emissions Framework

"We calculate below emission per capita profiles for each class. Our study considers only emissions from three sources – cooking and lighting, electricity and transport - which are responsible for the bulk of emissions within a household. Total emission from a household (which is emissions from cooking, electricity and transport in our analysis) can be

written as a function of C, E and T which correspond to cooking, electricity and transport.

$$E(C,E,T) = \sum_{i=1}^{n} C_i Cx_i + \sum_{j=1}^{n} E_j Ex_j + \sum_{k=1}^{n} T_k Tx_k$$

C_i, E_j, T_k are the emission coefficients that correspond to unit consumption of each fuel source and Cx_i, Ex_j and Tx_k denote the quantity of fuel consumed" (Michael & Vakulabharanam 2014). The national sample survey gives the monthly consumption quantity of fuels used for cooking and lighting. We adopt the conversion factors used in the Green Peace Survey Report "Hiding behind the Poor", Ministry of Non-Conventional Energy Sources India and online sources like Carbon Trust, Carbon Foot Print Mapping Software, and International Energy Agency Statistics to verify the results (Ananthapadmanabhan et al 2007)[iv]. After generating the average per capita emissions for different classes based on these different categories, we generate gini values for emissions. The method of Gini decomposition used here is an adaptation of the Yitazakhi decomposition Methodology (Yitzakhi 1994) which shows how Gini coefficient can be decomposed into two (not the conventional three) components - the within group and the between group ones.

3.3.3 Climate Injustice Parameter

"We define a climate injustice parameter for different classes as below:

Climate Injustice Parameter (CIP) = (Share of emission of a class / Share of population of the class)(1-g_c)*

where share of emissions of a class=Class Emission/Total Emission, g_c stands for the class gini. We multiply the term with (1- g_c) to account for

the intra-class inequalities. Here classes with a lower gini value indicate that they emit more uniformly and a larger percentage of people contribute to the class emissions" (Michael & Vakulabharanam, 2015). The CIP we have defined takes into account both the share of emissions as well as the energy injustice.

3.4 Climate Change Classes and Inequality

We present below the results of the study. As mentioned in the methodology we consider emissions of a household from three sources, "Cooking and Lighting, Electricity and Transport". We only discuss the results from NSS 66th round (2009-2010) in this section. These results have also been discussed in Michael & Vakulabharanam (2015).

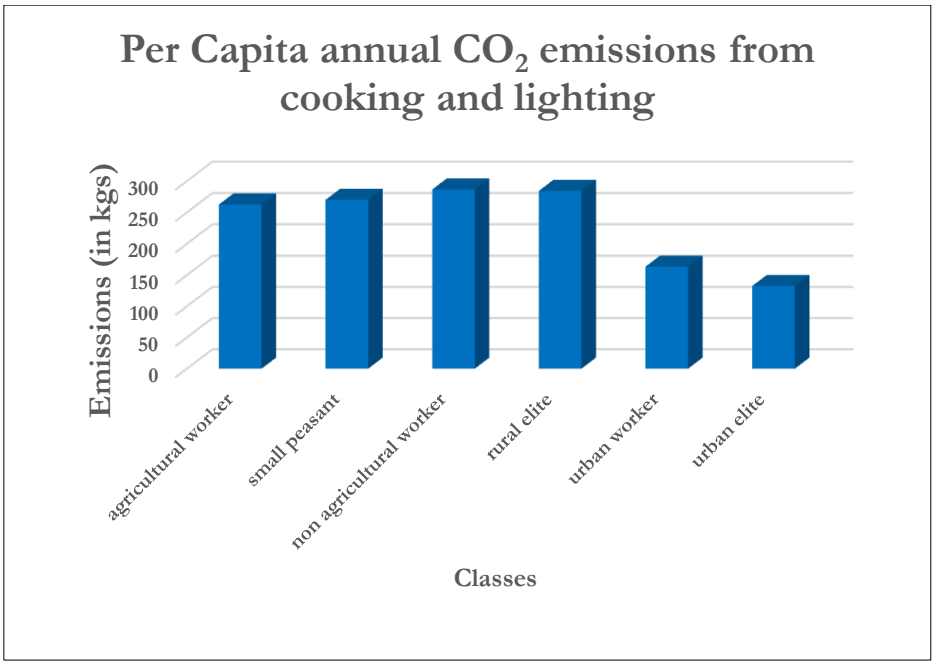

Figure 3.1: Class wise CO_2 Emissions from direct fuel use in cooking and lighting (2009-2010)

For analysing the emissions from cooking and lighting we consider. Fuel use for cooking accounts for 35% to 45% of the total energy consumed, if all energy carriers are considered (Pachauri, 2007). From Figure 3.1, it can be seen that emissions from cooking and lighting (comprising of emissions from firewood, dung cake, gobar gas, kerosene, coal and LPG) are high for rural classes when compared with their urban counterparts[v]. The maximum share of emissions from cooking and lighting is attributed to the rural elites and the non-agricultural working class. Thus even with rising incomes, social status and power in rural areas, the dominant fuel mix still consists of traditional fuel sources which have high environmental costs. Access to modern cooking fuels is severely limited in rural areas which explains the high usage of fuel wood and kerosene,

even among the rural elites (Bhattacharyya, 2006). On an average, a typical rural household consumes 30% more energy than its urban counterpart (Reddy, 2004). But, if we consider the useful energy, this amount comes down significantly due to the inefficiency of energy use by the rural households (ibid). Consumption of efficient fuel sources like LPG for cooking and electricity for lighting is responsible for the low emission rates of the urban elite and urban working class. Thus it is clear that the dichotomy in urban rural energy consumption patterns is not just due to lack of ability to pay but due to low access of information regarding alternative clean fuel sources, lifestyle patterns and willingness to pay. Increasing the access of the poor and rural population to cleaner and more efficient energy sources and energy end-using devices has been a policy objective for many years. Its desirability is argued primarily from an environmental social health and efficiency view point (Pachauri, 2007).

However, when we compare the emissions from cooking across various rounds we see a slow transformation from firewood and dung cake to LPG in rural areas with large regional variations.

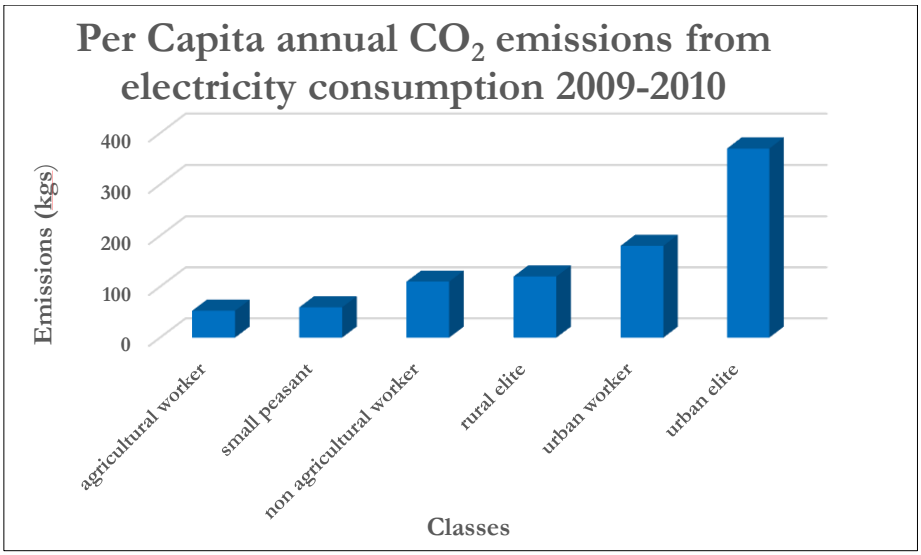

Figure 3.2: Class wise CO_2 emissions from electricity consumption (2009-2010)

Figure 3.2 gives the class-wise emissions from usage of electricity. As per our study the sharpest increase in emissions among different classes is for electricity. In 2001 approximately half the GHG emissions from the household sector came from electricity (Mestl and Eskeland, 2009). In the future, electricity consumption will completely dominate the GHG emissions (ibid). This is because much of electricity will come from coal-fired power plants, and emissions are high due to low conversion efficiency and distribution losses (ibid). The highest emitting class, urban elites, emit almost 7 times more than the lowest emitters, rural agricultural workers. As per the NSS 61st round, 44% of the households in rural areas still do not use electricity for lighting (NSSO, 2007). Even if they have access to the electricity grid, they rarely have access to reliable power. Several reports including the NCAER survey (2005) report that even already electrified households in rural areas still use kerosene for lighting, with an amount of kerosene only 27% less than non-electrified

households. However, any difference in emissions from electricity for lighting by the urban elite households is offset by use of efficient lighting devices like Compact Fluorescent Lamps. So it can be assumed that the significant difference in emissions from electricity stems from the increased use of household appliances. The increase of household incomes, advent of consumerist culture, changes in lifestyles etc have contributed to a significant increase of appliances in urban areas. The Green Peace Study also gives a similar explanation to the large difference in emissions from various income groups in the country (Anathapadpanabhan et al, 2007). With increasing income, consumption seems to have changed from essential goods like food and clothing to a variety of life style goods including electronics. Basic appliances such as fans and TVs are more evenly distributed among households. But there is a significant increase in the ownership of appliances like air conditioners, washing machines, and water heaters among the urban elite class.

Another significant contributor to differences in class level emissions is from the transport sector. The rapid growth in personal vehicle sales indicates strong energy growth in the area. A study by DFID predicts that the overall CO_2 emissions of transportation in India could increase to 1,200 million tonnes in 2030, which is roughly 70% of India's total CO_2 emissions today (DFID Study, 2006). A massive proportion of the emissions from transport can be attributed to the increasing sales of cars and two wheelers in the country especially in urban areas. Inadequacy of the public transport system is another reason for the rapid increase in personal vehicles.

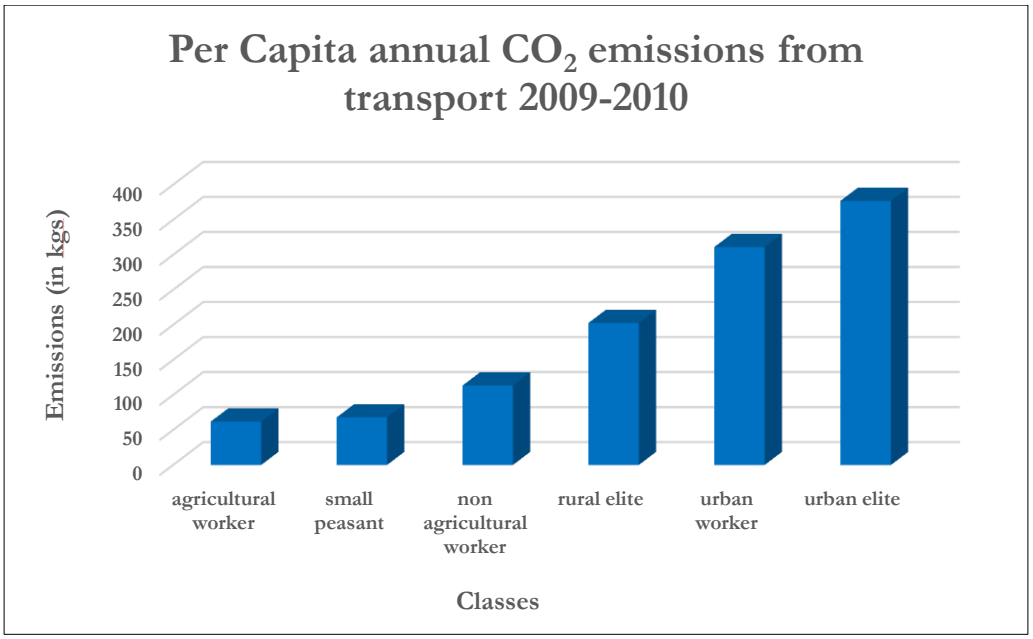

Figure 3.3: Class wise CO_2 Emissions from Transport (2009-2010)

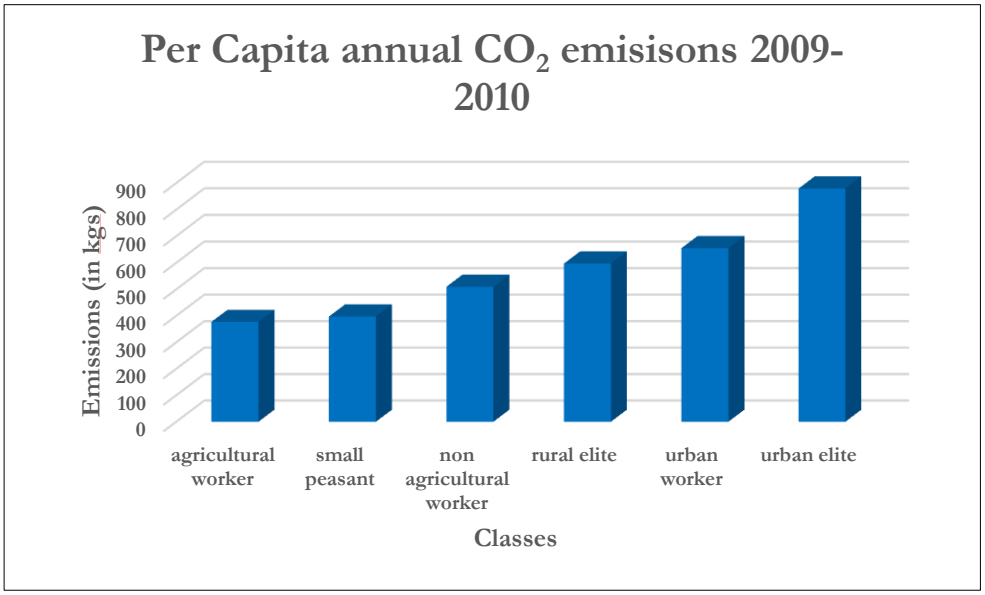

Figure 3.4: Per capita Annual CO_2 Emissions 2009-2010

To summarize our findings, the average per capita emissions assessed by this study for all India is 629 kg. Urban elites are the highest emitters in the country. The lowest emitting class, the agricultural labourers, emits just about half of what the urban elites do. The rural elites also account for a significant amount of the emissions. The difference in urban and rural emissions can be attributed to increased access to labour saving appliances, increased use of energy for transport in urban areas, while the rural areas are characterized by significant energy poverty.

3.4.1 A Climate Injustice Model for India

"The term climate injustice is used here with respect to the shares of damages caused to the atmosphere by different classes in the country" (Michael & Vakulabharanam, 2015)[vi]. Most of the observed increase in global average temperatures since the mid 20th century is very likely due to the observed increase in Green House Gas emissions (IPCC, 2007). Discernible human influences now extend to other aspects of climate including ocean warming, continental average temperatures, temperature extremes, and wind patterns. Hence, we assume in this model that CO_2 emissions are directly proportional to the damages caused to the atmosphere in the form of global warming, glacial melting, and sea level rise, reduce in agricultural yields, loss of livelihood and so forth (ibid). The Climate Injustice parameters for different classes are presented below.

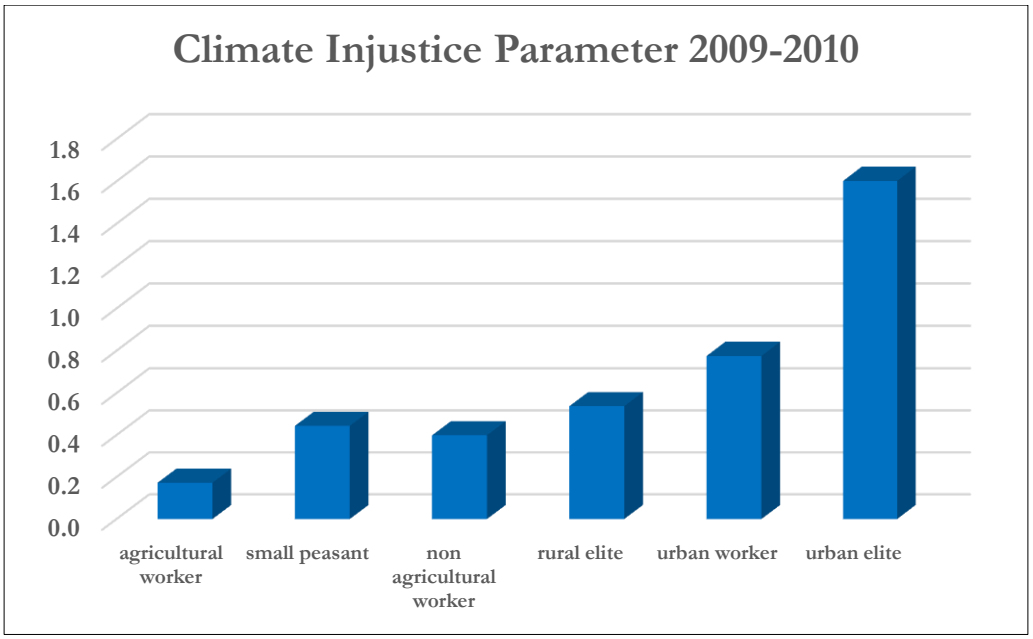

Figure 3.5: Class wise Climate Injustice Parameters 2009-2010

The graph clearly indicates that the highest share of damage in the country is caused by the urban elite. There is a clear cut difference in the emission rates of urban and rural India. All rural classes in the country have emission rates below the average national per capita while the urban classes especially the urban elites have much higher levels than the average percapita emissions of the country. We can observe that the emission rate of the urban elite in the country remains hidden when we look at only the macro per capita emissions, because of the lower rates of emissions by the remaining classes in the country[vii].

Table 3.3: Decomposed Emission Gini Values 2009-2010

	Decomposed Emission Gini Values 2009-2010				
	Emission Share	**Gini**	**Overlap**	**Contribution**	**Percentage**
Overall Gini		0.520		0.520	100
Intra Group				0.367	71.1
Agricultural Worker	0.097	0.707	1.040	0.071	13.670
Small Peasant	0.050	0.316	0.570	0.009	1.730
Non Agricultural Worker	0.150	0.603	1.136	0.103	19.800
Rural Elite	0.170	0.329	0.729	0.041	7.800
Urban Worker	0.320	0.372	0.741	0.088	16.950
Urban Elite	0.210	0.393	0.636	0.053	10.100
Inter-Group				0.153	28.90

Table 3.3 presents the results of the class-wise decomposed emission gini values for the NSS, 66th round (2009-10). The bulk of the contribution to the inter-group component of inequality is attributed to the urban elite class. The overall Gini ratio for the study is 0.52. The intra-class component of emissions is higher among rural non-agricultural workers and rural agricultural workers indicating that a very small proportion of these classes contribute to the existing emissions. This could also be an outcome of the energy poverty existing in these classes.

Table 3.4: Decomposed Emission Gini Values 1993-1994 and 2004-2005

Decomposed Emission Gini Values 1993-1994						Decomposed Emission Gini Values 2004-2005				
	Emission Share	**Gini**	**Overlap**	**Contribution**	**Percentage**	**Emission Share**	**Gini**	**Overlap**	**Contribution**	**Percentage**
Overall Gini		0.386		0.386	100.000		0.489		0.489	100.000
Intra Group				0.376	97.540				0.372	76.000
Agricultural Worker	0.182	0.363	0.991	0.066	17.040	0.094	0.547	0.963	0.049	10.190
Small Peasant	0.169	0.457	1.024	0.079	20.520	0.061	0.496	0.961	0.029	5.930
Non Agricultural Worker	0.055	0.342	0.960	0.018	4.718	0.075	0.537	0.999	0.040	8.260
Rural Elite	0.324	0.374	1.000	0.121	31.545	0.196	0.448	0.905	0.080	16.300
Urban Worker	0.177	0.347	0.966	0.059	15.350	0.425	0.367	0.778	0.122	24.880
Urban Elite	0.093	0.382	0.967	0.034	8.859	0.149	0.431	0.780	0.051	10.440
Inter-Group				0.010	2.460				0.117	24.000

Table 3.4 provides a comparison of the decomposed gini values of emissions for NSS 50th round (1993-94) and NSS 61st round (2004-05). In terms of the overall emissions inequality in India, the Gini coefficient has increased by around 26.7% between 1993-1994 and 2004-2005. We also find that there is a spectacular jump in the inter-class component of emissions inequality from a mere 2.5% of the aggregate inequality in 1994 to about 24.0% in 2004-2005 and 28.9% in 2009-2010. The intra-class component of inequality has also witnessed a steady increase for all the classes. We also notice a significant increase in the intra-group inequality for the rural non-agricultural workers and rural agricultural workers and a higher stratification in terms of emissions as given by the overlapping indexes (>1). The implications of this increase needs careful analysis although a surmise is that this is because of an energy transition which is happening slowly in these classes from traditional fuel sources to cleaner

and efficient sources with variations across different states and regions.

3.5 Discussion and Conclusions

Emerging patterns of economic inequality in the country after India embarked on market friendly reforms have had their impact on the emission structure of the economy, notably at the household level. This is probably an explanation for the significant increase in the inter-class component of inequality from a mere 2.5% in 1993-1994 to 24% in 2004-2005 and 28.9% in 2009-2010. Most of the observed increase in the inter-class component of inequality is attributed to the increase in the luxurious consumption patterns among the urban elites. Vakulabaranam (2010, p.147-149) reports that consumption shares of almost all poor groups have witnessed declines implying that it was luxury consumption that has fuelled the private consumption patterns. "Luxury consumption, non-agricultural investment and export led growth sectors have tended to become enclave like, while the rest of the economy that contains the predominant majority in India has not significantly benefited from the growth process" (ibid). Our study on class analysis of emissions has highlighted the encroachment of the carbon space of the rural non-elite classes by the urban classes as well as rural elite class. It has also exposed the severe energy injustice occurring within the country. The rural-urban divide in emission rates also points to the lack of availability of basic energy services to the majority in rural areas. "India with over a billion people, today only produces 660 billion KWH of electricity and over 600 million Indians, a population equal to the combined population of USA and EU have no access to electricity and limited access to other clean modern fuels such as LPG and kerosene which is reflected in its low

Human Development Index" (Ministry of Environment and Forest, Ministry of Power, Bureau of Energy Efficiency Government of India 2007). While attention needs to be paid to the development of clean and affordable energy sources for the country, there are some questions which require deeper investigation. Ananthapadmanabhan et al., (2007) endorse the concept that the emission scenario needs to be examined not only from a perspective of equity but also from that of sustainability. IPCC studies clearly indicate that emission reductions from industrialised countries alone cannot achieve stabilisation of climate change (Sathaye et al., 2007). The current levels of economic growth are based on increased depletion of natural capital and rising emission levels. Daily notes that the concept of carrying capacity incorporates both bio physical and social constraints where the former refers to "the maximum population size that an area can sustain under given technological capabilities" and the later pertains to . the maximum population size that an area can sustain under a given social system, with particular reference to associated patterns of resource consumption (Daily 1996, p.992). Magdoff and Foster argues that "the sustainable planetary boundaries in three of the systems climate change, biodiversity and human interference with the nitrogen cycle have already been crossed; however climate change is the biggest, most immediate threat occupying a central place since it overlaps with all other"s (Magdoff & Foster 2011, p.12). Given the constraints on the earth's carrying capacity it is of critical importance to curb the runaway consumption of the rich so that they do not encroach upon the development space of the poor. The trends of growing emissions from developing countries alone (Indian emissions grew at 4% per annum between 1990 and 2000) could force the atmospheric concentration to

exceed stabilsation levels of 550 ppm. To create the space for the remaining 980 million people in the country to develop without heating the planet above 2 degree centigrade, India needs to find ways to reduce the CO2 emissions of the upper 150 million people (Ananthapadmanabhan et al., 2007).

The relationships between society and environment have come under increasingly active scrutiny by the social sciences. Environmental issues are becoming increasingly 'social' and 'political' (Dickens, 2004). Foster (2004, 2008) has written extensively on the contradictions within the capitalist system, which renders impossibility of solving the environmental crisis. He argues that the planet as a whole is under the grip of capital and we see manifestations of the rift in man's relations with nature everywhere. "It is important to recognize this as a question of class and other forms of social inequality as well as inequality between nations." (Magdoff et al., 2011, p.34) Ecological degradation is related to the divisions within the world capitalist system and classes as power structures form an important part of the system governed by dominance and dependency as evidenced by our study (ibid). The Marxist approach redefines the terms of mainstream environmental debate and instead of seeing the problem as one of humans versus nature, the problem is framed as one where humans and nature are intrinsically linked and ecological crises arise in which the relationship between the two is thrown into imbalance (Pemberten, 2011).

The findings of the study can be interpreted in the light of the three fundamental questions posed by Boyce discussed in Chapter 2. Who benefits from the economic activities that create environmental harm? Who suffers from environmental harm? Why is that some people are able

to impose environmental harm on the others?

In answering the first question, as per our study, we have seen that the emissions from the urban classes, especially the elites, are quite high for electricity and transport compared to cooking. This is a clear indication of increased use of labour-saving appliances and increased use of two wheelers, cars, buses, and airplanes. As per the Green Peace Survey report (Ananthapadmanabhan et al., 2007). "The emissions from appliances increases from 4 kg per person in the below Rs.3000 income class to 534 kg of CO_2 per person in the higher than Rs.30, 000 income class by a factor of 136". Another study shows that from the 1980s to 2003, the number of vehicles on the road increased by almost 15 times (Bose, 2006). These results compare internationally also as discussed above. As per our study, the urban elite class has contributed substantially due to their luxurious lifestyle to the growing carbon emissions. As the elites consume more, they also have the power to transfer the effects (like polluted localities) to the poor and the powerless. Adhering to the sustainable development criteria, Boyce also argues that "environmental harm means actions that compromise the ability of future generations to meet their needs" (Boyce, 2012). While the impact of climate change is attributed to historic emissions of developed nations, the current emissions too are significant drivers of the future rises in temperature. Questions of inter-generational equity also have to be addressed in this context. All climate protection is non-rival and non-excludable. This complicates issues like free riding which is seen both at the national and international levels.

The response to the second question posed above will depend directly on the assets possessed by different classes in the form of land, labour,

wealth or capital and so forth. As per our study, the worst hit will be agricultural labourers with no diverse assets. The agricultural labourers in our study do not own any piece of land and have the lowest consumption values. Increase in food prices as a result of a potential decline in food production will directly affect their food security and calorie intake. Moreover a decline in farm revenue will lead to a fall in wages or lack of employment opportunities. This could lead to increased migration to the rural non-farm sector and to urban areas. The increase in food prices and reduction in wages will heighten the vulnerabilities of the rural non-agricultural labourers and urban workers. The class of small peasants has been reeling under agrarian distress and adverse environmental change can only aggravate it (Vakulabharanam and Motiram, 2011). All in all, urban and rural poor seem to bear the brunt of development activities in the city in the form of polluted neighbourhoods, and erratic weather patterns.

In response to his third question, Boyce (2008) gives three possibilities, which are: (a) the affected either belong to future generations; (b) lack information on the extent of harm; (c) are powerless to prevent any harm on them, and become silent victims. As Naidu et al (2010) observe, the ruling elites, who can be compared to the elites in our class structure, attempt to control nature directly by imposing capitalist property rights, forcing the displacement of peasant population, restricting the working people in their use of common property resources, typically supported by the state (Castree 2008, Harvey 2003).

The issue of intra-country equality in emissions has largely been ignored in India's energy and climate action plans. Energy poverty is the biggest social concern related to energy use in India and household energy use is

often determined by social factors (Pachauri, 2007). Per capita energy consumption in India is not just low in comparison with the standards of developed countries, but also with those of the developing countries (Ministry of Environment and Forest, Ministry of Power, Bureau of Energy Efficiency Government of India 2007). It is 17 times lower than that of United States, eight times lower than that of Denmark and England, nine times lower than that of Japan and about two-and-a-half times lower than that of China and Brazil (ibid). While India should reinforce this fact in international negotiations and fight for its right to development, it should not be forgotten that India is one of the top five emitters in the world[viii]. India has to urgently devise measures to generate adaptation and mitigation costs, which can be done by targeting the emissions of the elites. As we showed above, a fundamental transformation in India's emission structure is possible only if inequalities are addressed also from an environmental viewpoint.

3.6 Endnotes

[i] A similar approach identifies capitalism as the causal structure for environmental change, a phenomenon that is manufactured in a crucible of inequality that arises of the deeper systemic dynamics. (Magdoff et al 2011).

[ii] At the international level, vulnerability analyses of climate change clearly point out that the brunt of climate change falls largely on developing countries who have contributed least to the problem. The developed countries collectively account for 7 out of every 10 tonnes of CO_2 that have been emitted since the industrial era (Watkins 2007). Historic emissions amount to around 1,100 tonnes of CO_2 percapita for Britain and America compared with 66 tonnes percapita for China and India (ibid).

[iii]The residential sector emissions includes emissions a)from direct final use of fuels (e.g., for cooking), b) does not include any upstream CO2 c) does not include CO2 from electricity use by homes, which is reported/aggregated in the electricity generation sector, d) nor does this value include CO2 from transportation fuel use by households.

[iv] The Green Peace Survey has obtained the conversion factors for calculating CO2 emissions from various energy sources were taken from various secondary sources like Ministry of Non-Conventional Energy Sources, BRANZ (Building Research Association of New Zealand) Study Report SR118 (2003) New Zealand and IEMA (Institute of Environmental Management & Assessment). The Green Peace coefficients are reported in the appendix.

[v] Emissions arising from the use of electricity in lighting have not been calculated, as electricity consumption is considered in a separate section.

[vi] The current CO2 emissions will be drivers of future rises in global temperatures.

[vii] There has been an improved understanding internationally that per capita emissions hide the deeper picture of inequalities in the country. For instance, a study in Israel on household emission profiles depicts that in domestic electricity consumption and private vehicle use, individuals in the top income decile emit approximately 25 times more than those belonging to the bottom decile (Rabinowitz D et al 2011). A study on Sydney's transport emissions also revealed that a small proportion of households accounted for majority of transport GHG emissions (Zhao et al 2014). The richest 10 percent of British households emit three times that of the poorest 10 percent (Hargreaves et al 2013). However, most of these analyses focus mainly on an income centered approach to emissions. Minx et al 2013 show that the carbon footprint of cities and other human settlements in the UK is determined mainly by socio economic factors rather than

geographic and infrastructure drivers. They argue that income is not a more important determinant than other socio economic factors in analysing emissions.

[viii] In the Indian case, though there is concern over future emission trends in India, rising economic growth and increased fossil fuel consumption, India was responsible for only 4% of global carbon dioxide emissions in 2005 (Fujiwara 2010). The current projections are that India's CO_2 emissions for 2050, both absolute and per capita levels, will be roughly comparable to China's emissions in 2005 (Masetti 2011). The glaring inequalities in the country along the lines of income, wealth, caste and gender could easily worsen the scenario (Ananthapadmanabhan et al 2007, Jacoby et al 2011). India's predicted climate vulnerabilities and disasterscapes do not permit any form of complacency. Disasterscape is a term coined by Anu Kapur (2009) in her book "Vulnerable India" pg. no.5, defined as "a place where human life is lost or damaged, relationships ripped and livelihoods disrupted". With an economy closely tied to its natural resource base and climate sensitive sectors such as agriculture, water, and forestry, India faces a major threat because of the projected changes in climate. As Kapur highlights in her book, 59 million people in India were affected by disasters during 1982-2001. "Every year in the past two decades nearly 12% of the central revenue is siphoned off for purposes of relief towards disasters" (Ibid).

3.7 Appendix I

Conversion factors used to translate various energy uses into CO_2 emissions

Category	KG CO2 Emitted Per Unit
Electricity (per kW)	0.87
LPG (per kg)	2.78
CNG (per kg	2.67
Coal (per kg)	2.06
Kerosene (per litre)	2.41
Diesel (per litre	2.46
Petrol (per litre)	2.14
Air (per person/km)	0.26
Train-Diesel (per person/km)	0.13
Train-Electric (per person/km)	0.17
Firewood (per kg)	1.07
Gobar (per kg)	1.07
Gobar gas (per kg)	2.67

Source: Green Peace India Report, Hiding behind the Poor (Ananthapadmanabhan et al 2007)

3.8 Appendix II

Yitzakhi Methodology of Decomposing Gini Coefficient

The method of Gini decomposition used here is an adaptation of the Yitazakhi decomposition Methodology (Yitzakhi 1994) which explains how much of inequality is explained by inter class and intra class components. Let *G* be the Gini coefficient of emissions. The Yitzhaki decomposition allows us to separate *G* into inter-group inequality (I_b) and a remainder (I_r) that can be interpreted as intra-group inequality (Yitzhaki, 1994):

$G = I_b + I_r$

The amount of inter-group inequality is:

$$I_b = \frac{2\,cov(\varepsilon_i, \bar{F}_{oi}(e))}{\varepsilon}$$

Where e stands for emissions εi is mean emission for all persons in group, i and $\bar{F}_{oi}(e)$ is the mean rank of group i, i.e., the average position of the members of a group in the overall distribution. The remainder term is calculated as:

$$I_r = \sum_i s_i G_i O_i$$

The Yitzhaki decomposition takes into account the ranking of each individual within each group in the overall distribution where s_i is the

share of group i in aggregate emission, G is the Gini coefficient of the emission distribution within group i, and O_i is the overlapping index for group i. The index of overlapping proposed by Yitzhaki is a measure of the degree to which the range of emission in each group overlaps with the range of emission for all persons. Overlapping can thus be seen as the opposite of stratification: the higher the amount of overlap between a group and the population, the less stratified they are as a group in terms of wealth (Yitzakhi 1994:148-149).

The index of overlapping is constructed from indexes that indicate the amount by which a group overlaps with each of the other groups:

$$O_i = p_i + \sum_{j \neq i} p_j O_{ji}$$

Where pi is the share of group i in the total population and O_{ji} is the index of overlapping of group j by group i.

3.9 References

Aldred, Jonathan. (2009). Ethics and Climate Change Cost-Benefit Analysis: Stern and After, *New Political Economy*, 14(4): 469–88.

Ackerman, F. (2008). Critique of Cost-Benefit Analysis and Alternative Approaches to Decision-Making, Retrieved on October 16 2013, from Tufts University: http://www.ase.tufts.edu/gdae/Pubs/rp/Ack_UK_CBAcritique.pdf.

Ananthapadmanabhan G., K. Srinivas and Vinuta Gopal (2007). *Hiding Behind the Poor*, Bangalore, Green Peace India Society.

Bhattacharyya, S. C. (2006). Energy access problem of the poor in India: Is rural electrification a remedy? *Energy Policy*, Vol .34, 3387-3397.

Blaikie, P., Cannon, T., Davis, I., Wisner, B., (2003). *At Risk: Natural Hazards, People's Vulnerability and Disasters*, London: Routledge.

Bourdieu, Pierre. (1984). *Distinction. A Social Critique of the Judgement of Taste,* Cambridge: Polity Press.

Bose, (2006). Transport Sector and Climate Change in India, TERI/24th May 2006, Presented at regional Workshop on "*Climate Change Mitigation in the Transport Sector"* Held at ADB Headquarters, Manila (24-25 May 2006).

Boyce, J.K. (2008). *The Political Economy of the Environment*, Cheltenham, Edward Elgar,.

Boyce, J. K. (2008). Is Inequality Bad for the Environment? *Equity and Environment Research in Social Problems and Public Policy*, Vol .15, 267-288.

Bradley, C. Parks, J. Thimmons Roberts. (2005). *Understanding Vulnerability to Disasters: A Cross National Analysis of 4000 Climate Related Disasters*, College

of William and Mary, presented at the annual meeting of the American Sociological Association, Marriott Hotel, Loews Philadelphia (August 12 2005).

Brundtland, G.H. (1987). *Our common future,* New York Oxford University Press.

Caney, S. (2010). Climate Change,Human Rights and Moral Thresholds. In S. C. Stephen Gardiner, *Climate Ethics* ,163-177, Oxford, Oxford University Press.

Castree, N. (2008). Neoliberalising Nature: Process, Effects and Evaluations, *Environment and Planning A*, Vol 40(1), 53-73.

Chakravarty, S., & Ramana, M. V. (2012). The Hiding Behind the Poor Debate: A Synthetic Overview. In K. N. Dubash (Ed.), *Handbook of Climate Change and India: Development, Politics and Governance* (pp. 219–229). New Delhi: Oxford University Press.

Cogoy,M.(1999), "The Consumer as a Social and Environmental Actor", '*Ecological Economics,*13,169-80.

Daily, G. C., & Ehrlich, P. R. (1996). Socioeconomic equity, sustainability, and Earth's carrying capacity. *Ecological Applications*, 991-1001.

Department for International Development (DFID) (2006). Energy Efficiency and Climate Change Considerations for On-road Transport in Asia, 2006 Asian Development Bank. Retrieved October 16, 2013 from http://cleanairinitiative.org/portal/sites/default/files/agenda/70656_finalreport.pdf.

Dickens, P., 2003. Changing Our Environment, Changing Ourselves: Critical Realism and Transdisciplinary Research. *Interdiscip. Sci. Rev.* 28, 95–105.

doi:10.1179/030801803225010395.

Foster, John Bellamy and Brett Clark (2004): "Ecological Imperialism: The Curse of Capitalism", *Socialist Register* 2004. London: Merlin Press, 186-201.

Foster, John Bellamy (2008): "Ecology and Transition from Capitalism to Socialism", *Monthly Review*, Volume 60, Issue 06, November.

Foster, John Bellamy, Clark, B. and Richard York (2008): "Ecology: The Moment-of Truth an Introduction", *Monthly Review*, vol.60, iss.03, July-August.

Fujiwara, N (2010). The Political Economy of India's Climate Agenda, Working Document No. 325,Brussels, Centre for European Policy Studies.

Gram-Hanssen Kirsten (2004): Domestic Electricity Consumption-Consumers and Appliances in Reisch, L. A., & Røpke, I. (2004). *The Ecological Economics of Consumption*. Cheltenham, UK; Northampton, MA: E. Elgar.

Harvey, D. (2003). *The New Imperialism*, New York, Oxford University Press.

Hargreaves, K., Preston,I., White,V., & Thumim, J. (2013). Climate change and social justice: The Distribution of Household Co_2 emissions in Great Britain, *JRF Programme Paper Supplementary Project Paper No.* 1.

Hollander, J.M. (2003). *The Real Environment Crisis: Why Poverty Not Affluence is the Environment's Number One Enemy?* University of Berkeley, California Press,.

INCCA (2010). *India Green House Gas Emissions 2007*, Indian Network for Climate Change Assessment, Ministry of Environment and Forests Government of India, Retrieved August 4 2013,

http://moef.nic.in/sites/default/files/Report_INCCA.pdf

IPCC (2007). Summary for Policymakers. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)], Cambridge, United Kingdom and New York, NY, USA Cambridge University Press.

Jacoby, H., Rabassa, M., & Skoufias, E. (2011). Distributional implications of climate change in India. Policy Research working paper, No. WPS 5623. Washington, DC: World Bank Group.

Kapur, A. (2009). India's Disasterscape p.13, in A. Kapur, *Vulnerable India,* Indian Institute of Advanced Study, Shimla, Sage Publications.

Kapur, A. (2009). *Vulnerable India,* Indian Institute of Advanced Study, Shimla, Sage Publications.

Kuehn, Susanne (1998), "*Livsstilens betydning for energiforbruget"* (Sociologisk Instituts PhD serie nr 6), Copenhagen: Copenhagen University, Dept. of Sociology.

Lutzenhiser, L., & Hackett, B. (1993). Social Stratification and Environmental Degradation: Understanding Household CO2 Production. *Social Problems*, *40*(1), 50–73. doi:10.2307/3097026.

Magdoff, F. and Bellamy J.F. 2011. *What Every Environmentalist Needs to Know About Capitalism*, NY: Monthly Review Press.

Massetti, E. (2011). A Tale of Two Countries: Emission Scenarios for China and India, *Climate Impacts and Policy Division of Euro Meddittereanean Centre of Climate Change* , Working Paper 24, 2011.

Michael, K., & Vakulabharanam, V. (2014). Class and Climate Change in Post Reform India, *Climate & Development*, 1-10, http://doi.org/10.1080/17565529.2015.1034235.

Minx, J., Baiocchi, G., Wiedmann, T., Barrett, J., Creutzig, F., Feng, K., & Hubacek, K. (2013). Carbon Footprints of Cities and other Human Settlements in the UK, *Environmental Research Letters*, *8*(3), 035039.

Mestl, H.E.S., Eskeland, & G.S., (2009). Richer and Healthier, but not Greener? Choices Concerning Household Energy Use in India, *Energy Policy* 37 (8), 3009–3019.

Mukhopadhyay Kakali. (2008). Air Pollution and Income Distribution in India, *Asia-Pacific Development Journal*, Vol. 15(1).

Naidu Sirisha C, Panayiotis T Manolakos. (2010). Primary Accumulation, Capitalist Nature and Sustainability, *EPW*, Perspective July 17, VOL XLV NO, 2010.

NATCOM. (2004). *India's Initial National Communication to the UNFCC*, Ministry of Environment and Forests, Government of India, Retrieved August 4 2013, http://unfccc.int/resource/docs/natc/indnc1.pdf.

NSSO (2007). National Sample Survey 61 st Round- 2004-2005. *Energy Sources of Indian Households for Cooking and Lighting*, Report No.511, Ministry of Statistics and Programme Implementation Government of India.

NSSO (2012). National Sample Survey 66th Round- 2009-2010, *Energy Sources of Indian Households for Cooking and Lighting*, Report No 542, Ministry of Statistics and Programme Implementation Government of India.

National Council of Applied Economic Research (NCAER) (2005). *Comprehensiv Study to Assess the Genuine Demand and Requirement of SKO*, New

Delhi, NCAER Report.

Pachauri, S, 2007. *An energy Analysis of Household Consumption: Changing Patterns of Direct and Indirect Use in India*, Dordrecht: Springer.

Parikh Jyoti, Gokarn Subir (1993). Climate change and India's energy policy options" *Global Environmental Change*, 1993; Vol 3(3).

Parikh Jyoti, Manoj K. Panda and N.S. Murthy (1997). Consumption Patterns by Income Groups and CO_2 Implications for India: 1990-2010, *International Journal of Global Energy Issues*, 1997, Vol.9, 4-5.

Parikh Jyoti, Manoj Panda b, A. Ganesh-Kumar b, Vinay Singh. (2009). CO2 emissions structure of Indian economy*, Energy* Vol. 34, 1024–103.

Pemberton, A. (2011). Marxism has an Ecological Heart, Saturday, August 13, 2011 from *Green Left Weekly*, Retrieved October 16, 2013, from http://www.greenleft.org.au/node/48513.

Planning Commission (2006). *Integrated energy policy*, Report of the Expert Committee,Government of India, New Delhi, August, Retrieved October 16 2013, http://planningcommission.gov.in/reports/genrep/rep_intengy.pdf.

Rabinowitz, D and Lubanov, C. 2011. Climate Justice in Israel: Inequality in Greenhouse Gas Emissions from Domestic Electricity Consumption and Private Car Use. *The Association of Environmental Justice in Israel* (AEJI), Position Paper no.1, January 2011.

Reddy B. S. (2004). Economic and Social Dimensions of Household Energy Use, 469-477 in E. &. Ortega, *Proceedings of IV Biennial International Workshop Advances in Energy Studies*, June 16-19, 2004 Unicamp, Campinas, SP, Brazil.

Reddy B.S, T.Srinivas. (2009). "Energy Use in Indian Household Sector-An actor Oriented Approach", *Elsevier/Energy*, Vol 34, 992-1002.

Reddy B.S, Gaudenz B.Assenza, Dora Assenza and Franziska Hasselmann (2009). "Energy Economy and the Environment", p.13, in G. B. B Sudhakara Reddy, *Energy Efficiency and Climate Change Conserving Power for a Sustainable Future*,New Delhi, Sage Publications India Pvt Ltd.

Rozelle.S, Jikun Huang, Linxiu Zhang (1997). "Poverty, Population and Environmental Degradation in China", *Food Policy*, Vol22, No.3, pp.229-251.

Sathaye Jayant, P. R. Shukla and N. H. Ravindranath. (2006). "Climate change, sustainable development and India: Global and National concerns", *Current Science*, Vol. 90(3).

Watkins Kevin. (2007). *Human Development Report 2007-2008:* "Fighting Climate Change: *Human Solidarity in an Undivided World"*, UNDP, Retrieved October 14 from http://hdr.undp.org/en/reports/global/hdr2007-2008/, Palgrave, Macmillian.

United Nations Development Programme (UNDP) (1990): *Human Development Report 1990*, New York Oxford University Press,.

Vakulabharanam, V. (2010). "Does Class Matter? Class Structure and Worsening Inequality in India", *Economic and Political Weekly*, Vol.16 (29), 67-76.

Vakulabharanam, V. & Motiram, S. (2011). "Political Economy of Agrarian Distress since 1990s" in *Understanding India's New Political Economy: A Great Transformation, eds. Sanjay Ruparelia, Stuart Corbridge and John Harris*, London, Routledge.

Yitzakhi, S. (1994). "Economic Distance and Overlapping Distributions", *Journal of Econometrics*, Vol.61, 147-149.

Zhao, J & Peters, A. (2013). "Socio-economic spatial characteristics and household transport greenhouse gas emissions: a Sydney case study, Australasian Transport Research Forum 2013 Proceedings 2 - 4 October 2013, Brisbane, Australia Retrieved on 2 April 2014 from http://www.patrec.org/atrf.aspx

CHAPTER

4

Class Inequality and Climate Change Resilience: Exploring the nexus in Liberalized India

Contents

4.1 Introduction

Environmental change, as the most catastrophic form of the global environmental crisis, has been widely debated for its direct physical impacts across countries, regions, and landscapes, India being no exception. Nevertheless, studies on environmental change have failed to adequately address sub-national scenarios of how environmental change is or will be perceived, defined and managed by various social groups in the country manifested by their socioeconomic conditions, norms and power relations. Malone, 2009 argues that environmental change has been mainly problematized as a global issue and the dominant paradigms have failed to adequately address questions of societal capabilities to cope with or adapt to these impacts, their vulnerability and resilience capacity. In this context, the chapter approaches the resilience capacity of various socioeconomic classes in India, after India embarked on market friendly reforms in 1991. Contrary to the dominant paradigms of resilience to enviornmental change that deal with incremental changes and rebound mechanisms we focus on the much neglected question in resilience studies, "*resilience for whom*"? (Brown, 2013). Our results emphasize that resilience to the global environmental change in the country is manifested through the socio-economic scenario where increasing inequalities blocks all measures to ensure sustainable livelihood options for the marginalised and the poor.

IPCC 2014 defines "resilience as the capacity of social, economic, and environmental systems to cope with a hazardous event, trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the

capacity for adaptation, learning, and transformation" (p.5). Societal capabilities to cope with the damages associated with environmental change are manifested through the social structures (Ribot, 2009). However the concept of resilience in global environmental change arena seems to be dominated by "static impact assessments" that project future climate scenarios on current social and economic conditions ignoring its distributional implications (Malone, 2009). Environmental change is a multi-faceted term that involves complex interactions of a number of factors such as existing inequities, distribution of resources, societal norms, unequal power relations and demographic patterns. The degree of impact associated with the climate crisis is in turn determined by these components. The study of potential vulnerability and resilience capacity of various socioeconomic groups should place emphasis on the underlying socioeconomic situation and the observed changes in these indicators over time.

"With an economy closely tied to its natural-resource-base and climate-sensitive sectors such as agriculture, water, and forestry, India faces a major threat because of the projected changes in climate" (Dubey, 2012). Climate change is predicted to contribute 50 million more poor people to India than there otherwise by 2040 (Jacoby, Rabassa & Skouas, 2011). It is also one among the most disaster recumbent nations in the world with as many as 1.2 billion people exposed to fragile landscapes prone to hazards such as floods, cyclones and droughts (Kapur, 2010). On the other hand India exhibits a blend of deep contradictions, where there is shameless profligacy and waste in consumption on one hand and severe deprivations of basic necessities like food, water, energy, shelter, and clothing on the other. India's economic growth in the last decade has

raised several concerns in terms of its present and future resource demands for materials and energy (Singh et al, 2012). India's post reform growth model followed a resource intensive growth strategy with far reaching socioeconomic and ecological consequences. As discussed in Chapter 3, study of direct household CO_2 emissions point out that all rural classes in the country have emission rates below the average national per capita while the urban classes, especially the urban elites, have higher emission levels than the average per-capita emissions of the country. The per capita footprint of the wealthiest Indians (top 0.01 per cent) could be as much as 330 times that of the poorest 40% and twelve times that of the average citizen of a rich country (Shrivastava and Kothari, 2012). The glaring inequalities in the country along the lines of income, wealth, caste and gender could easily aggravate the impacts of environmental change on India (Ananthapadmanabhan et al, 2007).

Situating itself within a climate justice framework this chapter combines questions of the carbon space sharing across different classes (discussed in the previous chapter) and their resilience to environmental change within a single framework unravelling the climate justice scenario within the country. The rest of the paper is organized as follows. Section 4.2 gives an overview of the ecological havoc unleashed by neo liberal development in India. Section 4.3 discusses the methodologies employed in the study, the data sources and a brief description of the variables contributing to the overall Climate Resilience Parameter. Section 4.4 presents the Climate Resilience Parameter for various classes and compares it with their respective Climate Injustice Parameters. Section 4.5 discusses the results and concludes.

4.2 An Ecological Critique of Neo-liberal Growth in India

Liberalised development in India has unleashed enormous ecological and social havoc (Shrivastava and Kothari, 2012). The economic reforms package initiated from 1991 in India instigated a development model in the country which endangered the fragile fabric of India's agrarian classes as well as unleashed the destruction of agro-ecological systems that ensured their sustenance. "*As today's economic growth paradigm continues its domination,there is increasing ecological collapse and socio economic inequity*" (Kothari, 2013).

The neo-liberal growth regime in India favoured modern capital intensive agriculture and commercial exploitation of resources promoting the ideology of a win-win solution that economic growth is compatible with environmental protection. Free market environmentalism as it is popularly called is mostly concerned with the imposition of capitalist property rights over nature, as a process of primary accumulation (Harvey, 1997). The Indian state has amply demonstrated a disposition towards the application of force in the pursuit of a policy of primary accumulation (Naidu, 2010). The results of these policies are that almost one third of India's population live today a life as displaces (thanks to the huge dams and mines) with little they can freely pick up from natural world and not enough money to buy the commodities the shops are brimming with either (ibid).

Fernandes, 2004 estimated that approximately six crore people were either displaced or affected on account of development projects in

general during the period 1947-2004; 40% were Aadivasis and 34 % consisted of Dalit's and other marginalised groups. Gadgil and Guha, 1995 argues that the postcolonial state, like its colonial precursor, privileges the 'national' over the local, the urban over the rural, and the 'modern' over the 'traditional'. In their analysis of ecological injustice in India, they divide India's population into three basic categories based on their varied access to the global commons namely the omnivores, ecosystem people and ecological refugees. The omnivores are the elites in the country who devour everything produced with varying powers to influence state policy. The eco-system people are dependent on their natural environment to meet their material needs and the ecological refugees comprise of those masses who have been displaced by the so called 'development drive'. However they argue that India's development trajectory which has always favoured the omnivores at the cost of the ecosystem people have created too large a number of ecological refugees in the hinterland. They cite a number of examples to highlight the scenario. The much popularised green revolution in the country which led to manifold increase in productivity was made possible through a strategy of selective enhancement of agricultural productivity with the increasing need for external inputs which favoured larger land holdings. These measures could also have been done on a wider basis by pushing for land reforms which might have favoured the ecosystem people. Also is of concern the fact that the environmental struggles in India are dominated by the upper middle classes to a much greater degree than in the US or UK (Williams & Mawdsley, 2006). Many environmental struggles in India at grassroot levels by marginalised people, often do not have access to basic information from government authorities as well as

ample media coverage which lead to their localisation and effective silencing (ibid).

De & Vakulabharanam, 2013 articulates that the post reform period in India was marked by an enclave model growth fuelled by luxury consumption . Urban elites were the primary actors in this enclave and benefitted the most from liberalization (ibid). On the other hand, the state reduced public investment in agriculture which explains the decline or stagnation of consumption shares of the rural agrarian classes (ibid). The paper also argues that ample subsidies were provided for large agriculturists and the rural elites, while the marginalised rural classes were largely pauperised (ibid). The distrubution of political and purchasing power with wealth or in other words the manner in which assets,income and access to resources are distributed determines the distributional consequences of environmental change as well as decisions about managing it (Boyce 2002, Wisner et al., 2003). The process of socio-economic exclusion at work in liberalised India exasperates the adapative capacity of the rural poor to environmental hazards like climate change. "*While projections of material and energy use in India points to serious levels of domestic and global environmental impact*" the country also remanis highly vulnerable to the impacts of climate change and "*has little in the way of climate preparedeness*" (Kothari, 2013, p.63). The integral links between socio economic inequalities deprivations and the environmental crisis has been largely ignored both at academic and policy levels (ibid). The chapter aims to address this gap by examining how the distribution of certain key socio economic variables underpins the climate resilience or climate preparedeness of different socio economic groups in in the country.

4.3 Methodology

The data source used for our analysis is the Indian National Sample Survey Household Consumer Expenditure Data, rounds 50(1993-1994), and 66(2009-2010). In the 50th round, 115,354 households were selected in the sample, out of which 69,206 are from rural area, and 46,148 are from the urban area. In the 66th round 100855 households were selected out of which 59,119 are in rural areas while 41,736 are in urban areas. The basic unit of analysis is the household for which monthly consumption data is available.

4.3.1 Class Framework

The whole analysis is done within the class framework adopted from Vakulabharanam, 2010 employed in Chapter 3 for analysing CO_2 emissions. It is based on occupation, ownership and social identification. Environmental issues are often perceived by its social construction, often defined by the dominant or the powerful classes. The working class are often considered as convienient depositories of social and environment hazards attributed to the so called *"developmental pursuits"* because of their inability to resist the harm inflicted on them (Newell, 2005). Examining the implications of the climate crisis within a class framework is critical to *"understanding causation (the distribution of benefit from environmental destruction), process (which social groups make these key decisions and through what decision-making structures) and distribution (of hazard and harm)*" (ibid p.71). The post reform growth period in India has reinforced the stratification of people on the basis of social classes, making the working classes

convienient entities of exploitation by the elites (Bullard, 2000). The class schema employed in this chapter helps to analyse the political economy implications of India's liberalised development, when coupled with the looming climate crisis.

4.3.2 The Climate Resilience Parameter

Environmental change or climate change doesnot occur in a political and social vacuum. The concept of resilience in recent years have been extensively moulded by liberal ideologies focused on individualism and market centric approaches (Cretney, 2014). *"The lack of acknowledgement of politics, power, inequality and agency provides fertile ground for those wishing to perpetuate neoliberal ideology to engage resilience as a tool"* (ibid p.637). Resilience studies have not adequately addressed distributional implications across different groups of people and questions about whose needs are being met (Brown, 2013). Cote and Nightengale, 2012 argues that, this insight calls for debating what is being maintained for whom and by whom, through these discourses of resilience.

The climate resilience parameter developed here draws its inspiration from this critical insight. There is hardly any study on climate change resilience in India at a household level. Using household consumption expenditure surveys we examine the climate resilience scenario in India within a social class framework. While many aspects of vulnerability and resilience cannot be quantified, this parameter seeks to unravel inequalities in climate resilience among the different social groups in the country and highlight the role of power asymmetries. Observable and measurable indicators have been widely used as proxies for quantifying aspects of vulnerability and resilience which are not directly measurable

or observable (Brenkertt et al., 2005). The emphasis of this indicator is on societal resilience and its changes over time associated with India's shift to the neo liberal regime. The individual indicators selected to constitute the material conditions and institutional access are not all inclusive. However these are key indicators that can help direct further research and analysis on the desirability of India's current development paradigm in the context of the looming climate crisis.

The indicators have been selected based on their relevance to climate change adaptation as well as on the availability of data from the National Sample Survey Office (NSSO). We present below the generalized formula to elicit the value of an indicator from the NSS data. R_{Xi} denotes the contribution of an indicator x to the total resilience parameter of the i^{th} class. Xi denotes the relative contribution of class *i* and *Pi* denotes the population percentage of class *i*.

$$R_{Xi} = \frac{X_i}{P_i}$$

$$X_i = \frac{x_i}{\sum_i x_i}$$

For MPCE the intra class inequalities have also been accounted for. In this special case the value of the indicator has been modified as below.

$$R_{Xi\,(X=M)} = \frac{X_i}{P_i}(1 - g_{Xi})$$

$$X_i = \frac{x_i}{\sum_i x_i}$$

Where M stands for MPCE. g_{xi} stands for the intra class gini.

We divide the Climate Resilience Parameter into two components. 1)

Material Conditions 2) Institutional Access. The Material Conditions comprises of two components, namely i) Monthly Per Capita Consumption Expenditure (MPCE) ii) Educational Status. MPCE can be considered as a proxy for income which also measures the direct purchasing power of these classes. While education can also be included in the institutional access, we found that it is better suited as a component of material condition in the Indian context, since it provides direct opportunities for migration from farm to non-farm sector in case of agrarian distress. Institutional Access Component is an aggregation of the percentage of disadvantaged households in different social classes. This takes into account the dependency ratio, members of socially disadvantaged castes, female headed households as well as those households without access to clean and efficient energy sources. Environmental change can act as a crisis catylst for the disadvantaged groups by compounding the associated vulnerabilities. Multiple disadvantages are considered as weights in the analysis, for.e.g. a female-headed household belonging to a schedule caste. India has a wide range of agro-ecological zones with considerable variation in agricultural productivity and climate. Hence, there could be huge regional and local factors that contribute to the Climate Resilience Parameter. Only a local level case study can capture these factors. However, since most of the climate change policy decisions are implemented at national level it seems meaningful to look at a generalised picture of the resilience capacities of various classes in the country.

4.4 Classes and Climate Resilience Parameter

We present the estimates of the Climate Resilience Parameter in the

following section. As mentioned in the methodology, the Resilience Parameter is divided into two components. 1) Material Conditions and 2) Institutional Access. We examine both of them closely below.

4.4.1) Material Conditions

i) MPCE

The first component of Material Conditions is the monthly per capita consumption expenditure which is available from the National Sample Survey. Consumption expenditure can be considered as a proxy of purchasing power of various classes. Boyce (2013) argues that when measured with the tool of cost benefit analysis the preference for environmental quality is determined by the "willingness to pay" criterion. However, the willingness to pay criterion does not imply that some people value environmental quality more than the others; it is but a reflection of their purchasing power to back their preferences. Thus the differences in purchasing power are often a determinant of how environmental harm is distributed and also a means of transferring the risks.

Figure 4.1 gives the class wise contribution of MPCE to the Climate Resilience Parameter. The classes which have witnessed positive gains in their contribution are the urban elites and the non-agricultural workers. The urban elites claimed the highest share of consumption expenditure in both the years and also secured a marked increase in their purchasing power. The non-agricultural workers have marginally increased their position pointing out the improvements in intra rural migration. The positions of urban workers, rural elites and small peasants have more or

less remained the same. The sharpest decline in purchasing power has occurred to the agricultural workers pointing to their declining resilience.

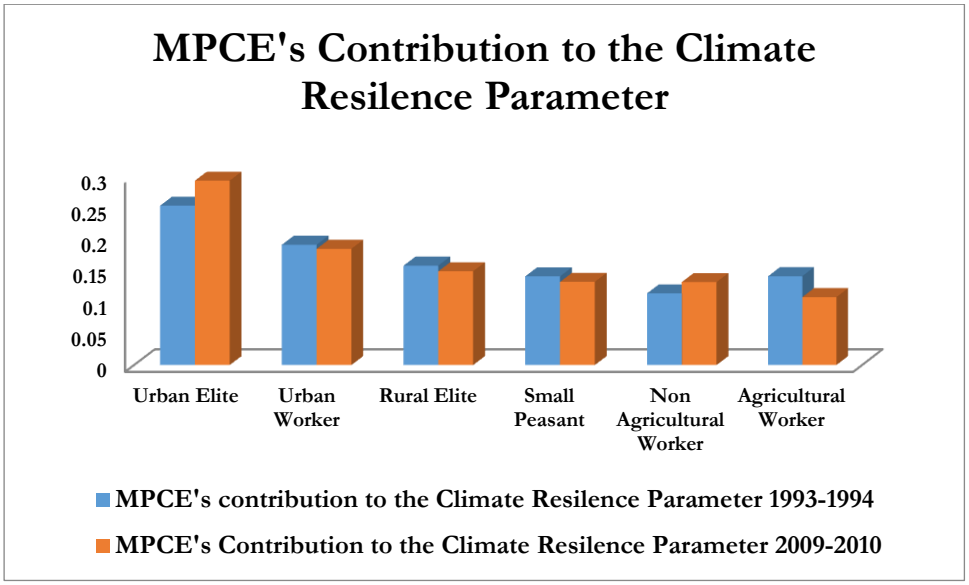

Figure 4.1: Class wise contributions of MPCE to the Climate Resilience Parameter (1993-1994, 2009-2010).

ii) Education

The second component of the Material Conditions is education. The number of illiterates reduces the resilience of all the classes, while formal education contributes positively to the resilience parameter. Illiteracy limits scope for participation in the workforce, society and community life as most of often illiterates fail to be recognised in social networks which constraints participation in the decision making process (Schlosberg, 2004). Being illiterate reduces access to resources and thereby chances of enhancing personal endowments. It restricts the scope of work, choices for relocation, as well as adapting and coping with

environmental disasters (Kapur, 2010). Formal education on the other hand increases the chances of migration from farm to non-farm sector and also widens the opportunities for productive employment by enabling participation in the formal sector. Higher education is associated with greater access to public facilities and hence is double weighted in our analysis when compared to primary educated people.

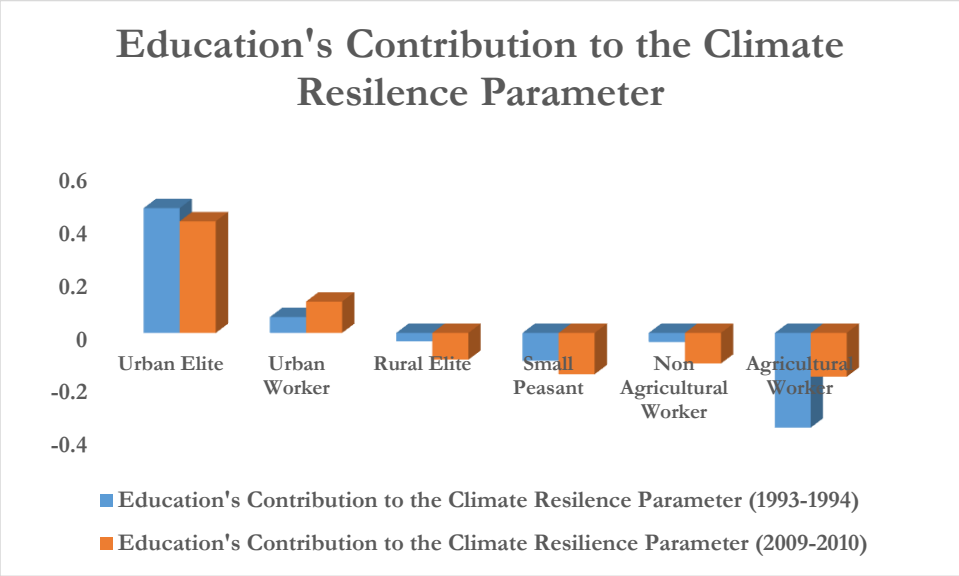

Figure 4.2: Class wise contributions of education to the Climate Resilience Parameter (1993-1994, 2009-2010).

As depicted in Figure 4.2, in terms of education, urban elites registered the highest share during both the time periods. Urban workers also registered a positive share in education during this period, which depicts the urban inclination of India's education policy. All the other classes registered a negative share in education. The non-availability of educational facility (particularly in rural areas), the high cost of education as a result of increasing commercialization, the landlessness and low

levels of land holdings leading to indebtedness of a major chunk of the rural population are among the main reasons that explains the negative share of rural classes in education. These things buttress the dire need to increase the public spending on education and the necessity to implement land reforms in the country. Investment in human capital of the poor through improved education, knowledge acquisition and skill development can strengthen their ability to combat environmental degradation of which they are victims not perpetuators as most of the pollution and natural resource depletion in developing countries as elsewhere is an outcome of greed and negligence of the rich and not desperation of the poor (Boyce, 2013). Such investments will improve their resilience as well as their power to resist the environmental harm inflicted on them by the rich and the powerful.

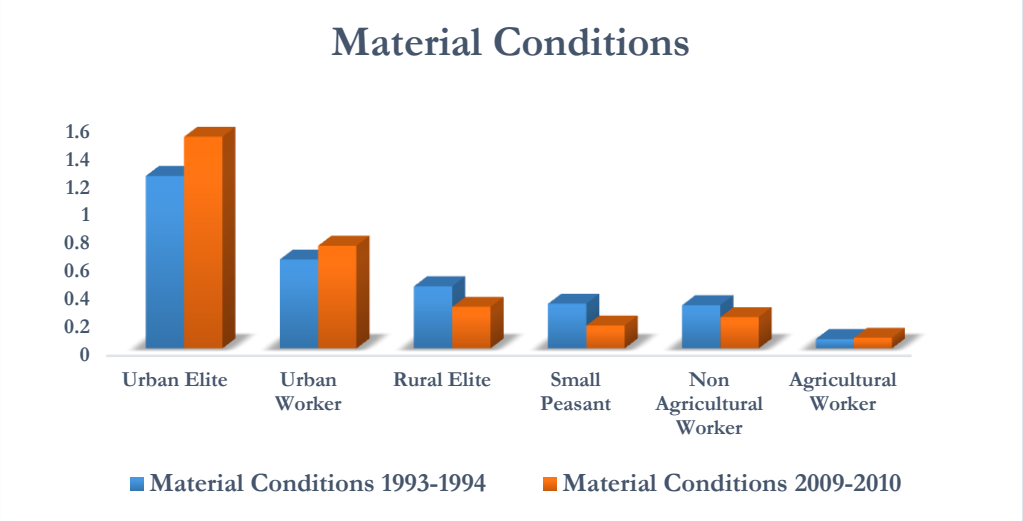

Figure 4.3: Class wise Material Conditions (1993-1994, 2009-2010).

The Material Conditions given in Figure 4.3 is a reflection of India's post reform growth dynamics where the resources have been mostly cornered

by the elite classes. Rural elites also emerged as a powerful group with positive increase in assets over the years. The decline in material conditions of the small peasants points to the pauperisation and marginalisation of these groups. A better distribution of material assets increases the income of the poor, reduces poverty and can contribute to increased resilience in the wake of climate change, for all the classes.

4.4.2) Institutional Access

The second component of the resilience parameter is termed as the institutional access. Institutional factors are important contributors to resilience building and recovery from hazards as they help in gaining access to information, skill development, capacity building, relief and recovery. Agrawal, 2010 defines the influence of institutions in climate change adaptation and climate vulnerability as below. "*a) They structure impacts and vulnerability, b) they mediate between individual and collective responses to climate impacts and thereby shape the outcomes of adaptation, and c) they act as the means of delivery of external resources to facilitate adaptation, and thus govern access to such resource*". It is of crucial importance to identify the unique challenges disadvantaged and socially excluded households face in the context of the climate crisis as they are already constrained in their institutional access.

The Institutional Access component is comprised of demographic features like share of disadvantaged people in each class, which is measured by the population share of Scheduled Castes (SCs) and Scheduled Tribes (STs), dependency ratio of each class, the percentage share of female headed households as well as fuel use patterns in households. We incorporated access to clean and efficient energy sources

as a component of Institutional Access as it has direct implications on poverty, wellbeing and subsistence needs of the poor. Social caste is a major component of discrimination in India with members of the SCs and Sts being ousted from many dimensions of socio economic growth (Kapur, 2010). *"While scheduled castes have been purposely left out of the mainstream when the goods of development were being distributed the isolation and cultural mores of tribal people meant their addition to the group of disadvantaged"* (ibid p.205). Therefore, it is not a surprise to see that the concentrations of these groups are mostly within the working classes and the non-elite groups. Increased distress migration of agricultural workers belonging to SCs and STs into the rural non-farm sector as non-agricultural workers were also noticed in the study.

The proportion of dependents in a household is considered to be an institutional vulnerability because the effects of it are institutionally mediated (Mustafa et al., 2011). Dependants like young children and the elderly can be an economic burden on the family resources in the absence of a well mediated social system taking care of them (ibid). Female-headed households seem to be the most disproportionately represented among the world's poor. They face great difficulty in gaining access to labour markets, credit, housing and basic services (Michael, 2011). Incidence of poverty is quite high among the female headed households in the non-elite sector; with the added vulnerability arising out of climate change these households will be eventually pushed into chronic poverty.

Access to clean and efficient sources of energy is a primary requisite for any sustainable development initiative. The energy ladder theory explains that as a household's socio-economic status improves there is a gradual

transition to cleaner and efficient fuels. However the rural, urban divide in access to energy is still very evident. Access to modern cooking fuels is severely limited in rural areas which explain the high usage of fuel wood and kerosene, even among the rural elites (Bhattacharyya, 2006). On an average, a typical rural household consumes 30% more energy than its urban counterpart, but useful energy is very less due to significant inefficiency of the fuels used (Reddy 2004, pp. 469-477). Besides dependence on primitive source of fuels like firewood, dung cakes are also associated with numerous health hazards. Green Peace's report on energy injustice in India argues that large power plants and centralised generation systems are currently the development norm in India, which caused large scale displacement of villagers and tribal' s as well as huge environmental costs (Ananthapadmanabhan et al., 2007). The benefits of this have accrued to the urban elites in the form of high per capita consumption. The vast majority of the rural population still do not have access to adequate and reliable power even though they had borne the social and environmental consequences of these power plants. On the other hand, electrification of rural households can definitely open avenues in rural India by improving agricultural productivity, delivery of health care services, easing of domestic chores for women, information assimilation through access to radio and television as well as assisting in income generation activities (Michael, 2011). The institutional access for the various classes in the country is presented in Figure 4.4.

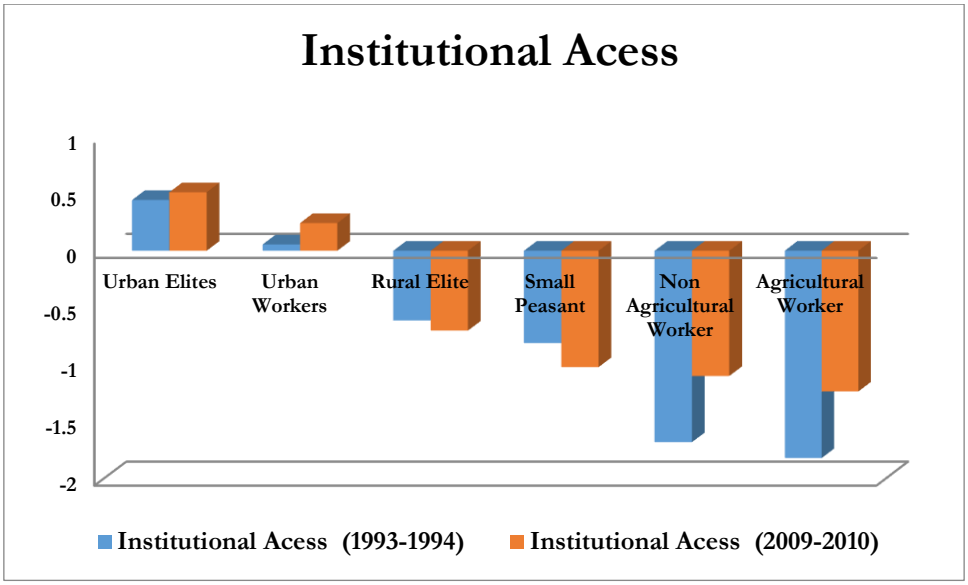

Figure 4.4: Class wise Institutional Access (1993-1994, 2009-2010).

The Institutional Access component reiterates that the urban elites have grown to be the most powerful class in the country as this class accumlated the benefits from the socio-economic policies of the state. Urban workers have also registered a much higher value of the resilince parameter compared to their rural counterparts. The Institutional Access data draws a clear picture of the neo-liberal growth regime riding roughshod over the rural classes, who bear the brunt of major chunk of climatic changes. This is a pointer to the high concentration of the disadvantaged people in these classes as well as lack of access to clean and efficient energy sources. A closer examination of the Institutional Access for the rural classes points to increased dependency ratio as well as lack of access to electricity and other cleaner fuels like LPG which is enjoyed by their urban counterparts. Institutional structure mediates access to land markets, social networks, livelihood diversification or even

invest in migration or education (Agrawal, 2010). Hence measures have to be taken to improve the Institutional Access of the rural classes in the form of social security benefits, public spending to improve the position of disadvantaged castes and tribes as well as measures to ensure energy security for rural India. The Climate Resilience Parameter for various classes in the country is given below.

4.4.3 Climate Resilience Parameter

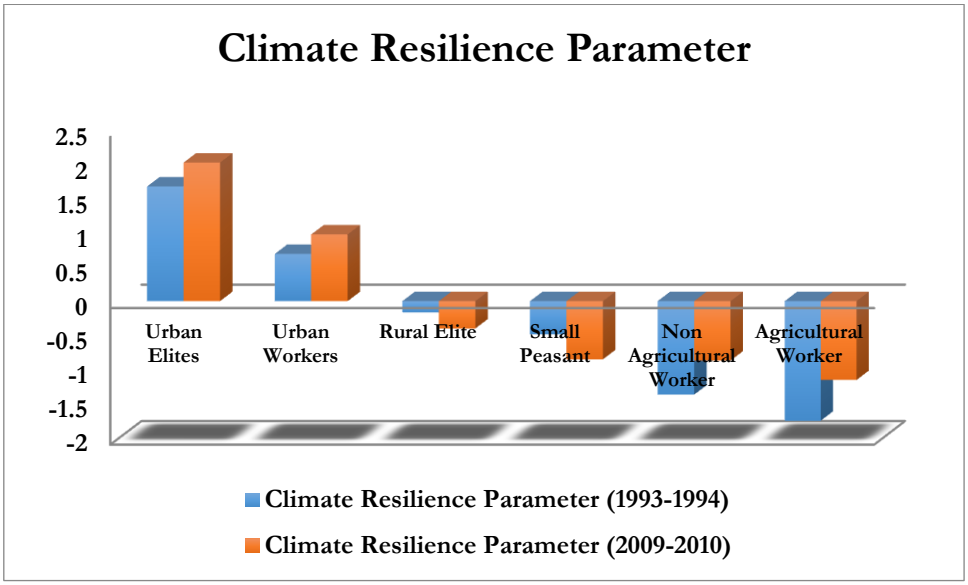

Figure 4.5: Class wise Climate Resilience Parameter (1993-1994, 2009-2010).

Figure 4.5 reveals the following important trends.

Urban elites experienced substantial gains in the post reform period with significant resilience to the climate change phenomenon. All the components of the resilience parameter show positive changes in the class over the years. Their asset holdings have increased and their

institutional access strengthened.

The urban workers have benefitted marginally from the new model of development. We can surmise that the impacts of climate crisis on urban India will be gradual phenomena with the tremors being spread from rural India.

Among the rural classes the rural elites have a positive resilience revealing that rural development packages are biased towards them.

Small peasants are the only class whose resilience parameter has come down over the years. They do not have any resilience to the predicted effects of climate change shown by the negative resilience values. This is no surprise as the marginal and small farmers in the country are reeling under debt traps with fragmentation and dispossession of land holdings as well as the resultant distress migration.

The non-agricultural workers and agricultural workers have minimal improvements in their resilience value. Yet, those marginal improvements are far from satisfactory, to make any significant impact on improving their resilience. The negative resilience of these classes shows the extent of their vulnerability to climate change or any environmental crisis.

4.4.4 Where is Climate Justice?

Figure 4.6 shows a comparison of Climate Injustice Parameters of the classes with the Climate Resilience Parameter. Climate Injustice Parameter is defined as the (Share of emission of a class / Share of population of the class)*(1-g_c) where g_c stand for the intra class Gini coefficient (explained in Chapter 3). The figure clearly indicates the built-

in exclusion of the market friendly growth process in India and its implications for the climate crisis.

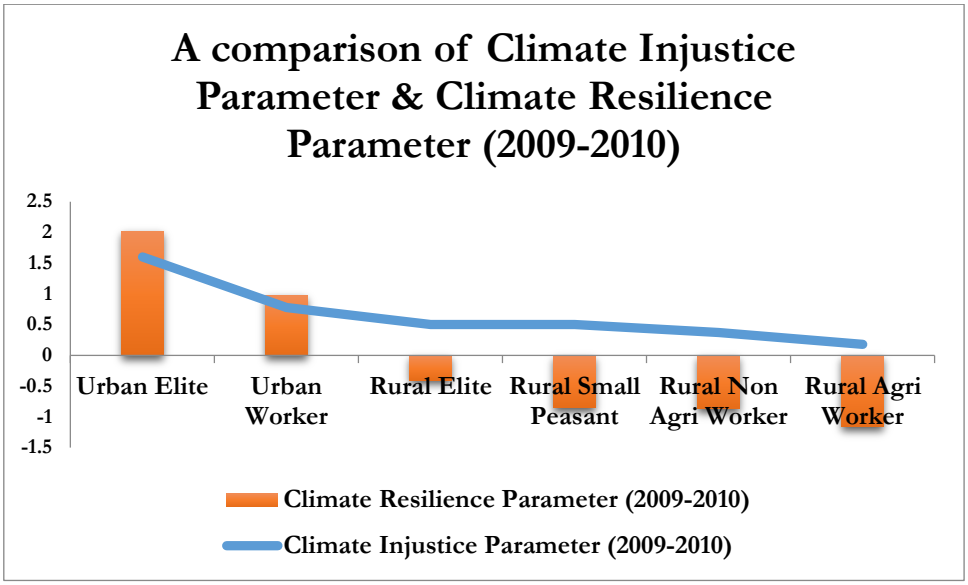

Figure 4.6: Class wise comparison of Climate Injustice Parameter and Climate Resilience Parameter (2009-2010).

The Climate Injustice Parameter reflects the carbon space usage by various social classes in the country. The Climate Resilience Parameter when compared with the Climate Injustice Parameter provides a clear exposition of the climate justice scenario in the country. Sterba 1998 lists two principles of environmental justice. *"A principle of allocating risks by production: one's share of the environmental risks to health and well-being should be proportional to the amount of pollution and contaminates one produces"* . *"A principle of allocating risks by consumption: one's share of the risk to health and well-being*

should be in proportion to the amount of resources one consumes." Our results indicate that neither are the risks proportional to the amount of pollution and contamination nor are they in proportion to one's consumption. Unequal power structures are mediated through inequalities that are inherent in the economy, which govern access and entitlement to the environmental commons. Figure 4.7 implies that the classes which pollute the most are least affected by the impacts of any environmental harm which need not necessarily be a direct one to one causal connection. This creates a lack of accountability for those who pollute as long as the costs of their actions are shifted to the marginalised and the powerless. This, in turn, produces a vicious circle where inequalities perpetuate more inequality.

India's official stance in international climate negotitations till date reflects the view that meaningful negotitations are not possible without addressing the fundamental issues of inequality, which created the climate crisis in the first place. However Bijoy, Ghosh and Dutta (2013) argues that India's position is not a principled one as the questions of equity seems to be reserved for only inter country scenarios completely ignoring the increasing inequalities within the country (ibid). Shrivasatava and Kothari (2012) argues that the neo liberal growth regime in India has been demand deepening for the elite classes rather than demand widening, cutting across classes. Our results lend empirical support to the socio-economic exclusion at work in the country, wherin the ecological costs of the unsustainable consumption patterns of the top quarter are imposed on threequarters of the population of the country, which has been largely excluded from the process of prosperity that has unfolded over the past two decades (ibid pg.42).

4.5 Conclusion

The ecological crisis human race is confronted with today cannot be viewed as a crisis of the ecology itself, with technological bullets as fixes; rather it is a manifestation of a consequent crisis of humanity whose effects have been unequally distributed. The post reform period in India witnessed a parasitic development pattern where a small majority of elites thrived at the expense of the vast majority of people who were dependant on the ecosystems for their sustenance and survival. India's development path was marked by severe environmental and climate injustice with the state acting as a perpetuator of the same. We established in the previous chapter that the elites in India are the major polluters both in an absolute sense as well as in per capita terms, while the working groups tend to suffer from acute energy poverty, and are the least polluters. The Climate Resilience Parameter we calculated also shows that the elites in the country are resilient to the prevailing impacts of the climate crisis whereas the vulnerabilities associated with it falls on the poor and the powerless. Urban elites seem to be immune to the impacts of climate change, at least in the near future, whereas the small peasants, agricultural and non-agricultural workers are being pushed over the margins. The multiple interactions of the neo-liberal growth dynamics and the climate crisis on are evident in the resilience parameters of the rural working classes. The Climate Resilience Parameter of the small peasants, agricultural and non agricultural workers depicts how natural factors like erratic rainfall and declining agricultural productivity interacts with the socio-economic conditions producing arresting outcomes like agrarian distress, farmer suicides and severe livelihood

crisis. It raises serious quesitions about the sustainability of a society marked by rising socio economic inequalities and increasingly at war with natural environment (Shrivastava & Kothari, 2012).

Boyce (2002, 2013) argues the distribution of environmental harm reflects the distribution of wealth and power. Societies with wider inequalities of wealth and power will tend to have more environmental harm. Social and economic inequalities drive environmental degradation as they promote excessive consumption. On the other hand the socio-economic inequality also blocks the implementation of sustainable practises as it devotes all the resources toward the elites thereby yielding them power to inflict environmental harm on the marginalised and the poor (ibid). The ecological destruction India is witnessing today is not just an outcome of the natural phenomena's but a social construction conditioned by political and economic disparities. As Boyce (2002, 2013) argues these are social constructions and can be restructured. Institutionalised exclusion and social culture of misrecognition should give way to democratic and participatory decision making process.

As the sustainability of the current economic model is questioned an alternate model should encompass small scale decentralised solutions which are rooted in the core principles of socio economic equity for a better planet. It is time to question the holy cow of growth (Kothari, 2004) and encompass an alternate development model that addresses the inherent crisis within the existing social, political and economic structures

4.6 References

Agrawal, A., (2010). Local Institutions and Adaptation to Climate Change, In: *Social Dimensions of Climate Change: Equity and Vulnerability in a Warming World* [Mearns, R. and A. Norton (eds.)], The International Bank for Reconstruction and Development / The World Bank, Washington, DC, USA, pp. 173-198.

Ananthapadmanabhan, G., Srinivas K., & Gopal, V. (2007). *Hiding Behind the Poor*, Bangalore, Green Peace India Society.

Bhattacharyya, S. C. (2006). Energy Access Problem of the Poor in India: Is Rural Electrification a Remedy?, *Energy Policy*, Vol.34 (18), 3387-3397, doi:10.1016/j.enpol.2005.08.026.

Bijoy,C.R, Ghosh.S& Dutta.S (2013) In *Climate change and India: Analysis of Political Economy and Impact* [Soumya Dutta, Soumitra Ghosh, Shankar Gopalakrishnan, C.R. Bijoy, Hadida Yasmin (eds)], Rosa Luxemburg Stiftung—South Asia and Daanish Books, India.

Bullard, R. D. (2000). Dumping in Dixie: Race, Class, and Environmental Quality, Boulder, Colo: Westview Press.

Boyce, J. K. (2002). *The Political Economy of the Environment*, Cheltenham, U.K. and Northampton, Edward Elgar Publishing.

Boyce, J. K. (2013). *Economics, the Environment and Our Common Wealth*, Cheltenham, UK; Northampton, MA: Edward Elgar Pub.

Boyce, J. K. (2014, December). As The Climate Changes, Adaptation Becomes Imperative, *Scholars Strategy Network*. Retrieved from http://www.scholarsstrategynetwork.org/content/climate-changes-adaptation-becomes-imperative.

Brenkert, A. L., & Malone, E.L. (2005). Modelling Vulnerability and Resilience to Climate Change: A Case Study of India and Indian States, *Climatic Change*, 72(1-2), 57–102, doi:10.1007/s10584-005-59303.

Brown, K. (2013). Global Environmental Change I A Social Turn for Resilience? *Progress in Human Geography*, 0309132513498837. http://doi.org/10.1177/0309132513498837.

Cote, M. and Nightingale, A. J. (2012). Resilience Thinking Meets Social Theory: Situating Social Change in Socio-Ecological Systems (SES) research, *Progress in Human Geography*, 36 (4), pp. 475–489, doi: 10.1177/0309132511425708.

Cretney, R. (2014). Resilience for Whom? Emerging Critical Geographies of Socio-ecological Resilience, *Geography Compass*, 8: 627–640, doi: 10.1111/gec3.12154.

De, R., & Vakulabharanam.V (2013). Regimes of Accumulation in India after Independence, Presented at the *World Economics Association (WEA), Conferences, No.3 2013*, Conference on the Inequalities in Asia: Retrieved from http://ineteconomics.org/sites/inet.civicactions.net/files/de.pdf.

Dubey, K,K. (2012) Climate Change and Sustainable Development in India in *International Journal of Strategic Organization and Behavioural Science*: Vol.2, No.1. (ed. Siddhartha Sarkar) Universal-Publishers.

Fernandes, W. (2004). Rehabilitation Policy for the Displaced, *Economic and Political Weekly*, 39(12).

Gadgil, M., & Guha, R. (1995). Ecology and Equity: The Use and Abuse of Nature in Contemporary India, London ; New York: Routledge.

Harvey, D. (1997). *Justice, Nature and the Geography of Difference* (1st edition.),

Cambridge, Mass: Wiley-Blackwell.

Kothari, A. (2014). India 2100: Towards Radical Ecological Democracy, *Futures*, 56, 62-72.

IPCC. (2014). Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects, *Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)], Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.

Jacoby, H. G., Rabassa, M., & Skouas, E. (2011). Distributional Implications of Climate Change in India, *World Bank Policy Research Working Paper*, (5623). Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1803003.

Jerneck, A. and Olsson, L. (2008). Adaptation and the Poor: Development, Resilience and Transition. *Climate Policy* 8 (2), pp. 170–182, doi:10.3763/cpol.2007.0434.

Kapur, A. (2010). *Vulnerable India: A Geographical Study of Disasters*, Shimla : Los Angeles: SAGE Publications Pvt. Ltd.

Mustafa, D., Ahmed, S., Saroch, E., & Bell, H. (2011). Pinning Down Vulnerability: from Narratives to Numbers. *Disasters*, *35*(1), 62-86. doi: 10.1111/j.1467-7717.2010.01193.x.

Malone EL (2009). Vulnerability and Resilience in the Face of Climate Change: Current Research and Needs for Population Information, *Battelle Memorial*

Institute, PNWD-4087.

Michael, K., & Vakulabharanam, V. (2014). Class and Climate Change in Post Reform India, *Climate & Development*, 1-10, http://doi.org/10.1080/17565529.2015.1034235.

Michael, K. (2011). Feminine Dimensions of Energy, In M.K.Saralamma & Manju S. Nair (Eds.), *Development VS Derivation in the Era of Globalisations* (Vol. 1), Sonali Publications.

Naidu, S., & T Manolakos, P. (2010). Primary accumulation, capitalist nature and sustainability, *Economic & Political Weekly*, (29), 39–45.

Newell, P. (2005). Race, Class and the Global Politics of Environmental Inequality, *Global Environmental Politics* (2005) 5 (3) 70-94, doi:10.1162/1526380054794835.

Quan, J. (2006). Land access in the 21st century: issues, trends, linkages and policy options. *FAO-LSP Working Paper*, 24. Retrieved from ftp://ftp.fao.org/docrep/fao/009/ah245e/ah245e00.pdf .

Reddy B. S. (2004). Economic and Social Dimensions of Household Energy Use, 469-477 In *E. &. Ortega, Proceedings of IV Biennial International Workshop Advances in Energy Studies,* June 16-19, 2004 Unicamp, Campinas, SP, Brazil.

Ribot, J. C. (2009). Vulnerability does not just Fall from the Sky: Toward Multi-scale Pro-poor Climate Policy, In R. Mearns & A. Norton (Eds.*), Social Dimensions of Climate Change: Equity and Vulnerability in a Warming World.* Washington, DC: The World Bank.

Schlosberg, D. (2004). Reconceiving Environmental Justice: Global Movements And Political Theories, *Environmental Politics*, 13(3), 517–540, doi:10.1080/0964401042000229025.

Shrivastava, A., & Kothari, A. (2012). *Churning the earth: the making of global India,* New Delhi ; New York: Penguin.

Sterba, J. P. (1998). *Justice for here and now*, Cambridge, U.K. ; New York: Cambridge University Press.

Singh, S. J., Krausmann, F., Gingrich, S., Haberl, H., Erb, K.-H., Lanz, P., J. Martinez-Alier Temper, L. (2012). India's biophysical economy, 1961–2008:Sustainability in a national and global context, *Ecological Economics*, 76, 60–69, doi:10.1016/j.ecolecon.2012.01.022.

Vakulabharanam, V. (2010). Does Class Matter? Class Structure and Worsening Inequality in India, *Economic and Political Weekly*, Vol.16 (29), 67-76.

Vakulabharanam, V. (2012). Class and Inequality in India Over Three Decades. Presentation at Jawaharlal Nehru University (JNU), at the conference commemorating 40 years of the School of Social Sciences at JNU., New Delhi.

Williams, G., & Mawdsley, E. (2006). Postcolonial environmental justice: Government and governance in India, *Geoforum,* 37(5), 660–670, doi:10.1016/j.geoforum.2005.08.003

Wisner, B., Blaikie, P., Cannon, T., & Davis, I. (2003). *At Risk: Natural Hazards, People's Vulnerability and Disasters* (2nd edition). London ; New York: Routledge.

CHAPTER

5

Environmental Change and Vulnerabilities: Case Study of Wayanad District

Contents

5.1 Introduction

The environment is tied together in a lattice of interdependence with the social, political and economic realms. Hence the implications of the environmental crisis need to be examined in an all-encompassing socio-ecological framework, as these elements together structure the lives of different groups of people. However technocratic solutions and the notions of sustainable capitalism have so far merely served as a safety valve for the existing system of natural and human exploitation. Thus as Bookchin (1996) articulates this chapter draws its inspiration from the approach that the environmental crisis has its roots in the very constitution of the society as we know it today and to bring about a new equilibrium between the social and natural world, a radical reorganisation of the society along ecological lines is inevitable, with equity at its core. The social ecological system based argument, discussed in the previous chapter is explored further here, through a field study in Wayanad district of Kerala, an archetype of the rural agrarian landscape in India subjected to multiple stressors like land use change, climate variability, price shocks, and massive environmental degradation among others. The chapter examines how the ecological crisis in the form of ecosystem degradation and environmental change is perceived within the broader patterns of the society where the damages associated with it are conditioned through the social, political and economic vulnerabilities of people and societies on ground (Ribot, 2009).

The dominant approaches on resilience and vulnerability still remains at an abstract theoretical level emphasising the trigger role of climate and ecological factors. However locating environment within a social realm, a

socio ecological system based approach integrates the physical and social aspects of vulnerability and resilience. The differentiated outcomes of the ecological crisis are attributed to the social processes which determines people's exposure to different kinds of risks (Wisner et al., 2003). Thus in this approach vulnerability becomes the antonym of resilience defined as the *"propensity of social and ecological system to suffer harm from exposure to external stresses and shock*". ("Resilience dictionary - Stockholm Resilience Centre," 2007)

Environmental change is a crucial defining force of contemporary development strategies. However it has been conceived predominantly as global issue with prescribed globalized solutions that often lack sufficient flexibility for national and subnational scenarios (Tanner & Allouche, 2011). Malone, 2009 argues that the political economy of environmental change reveals the mounting tension between the globalized nature of the issue and its highly differentiated small scale impacts. "However, since climatic impacts on natural and socio-economic systems are likely to be felt and responded to, at regional/local levels the heterogeneous conditions of individual societies necessitate more localized studies" (ibid). A localized study helps to locate environment (including climate) within a social framework and articulates the importance of assets and entitlements that determines a household's, communities or social group's susceptibility to a livelihood crisis (Wisner et al., 2003). Malone enunciates that the extend of harm associated with enviromental change is contingent upon how the natural trigger mechanisms interacts with particular ecosystems and the socio economic profile of the communities dependent on it, like the sensitivity of livelihoods, education levels, economic development etc. and also the resources available for

adaptation. (Malone, 2009).

There is an increasing recognition among environmental justice theorists on how the socio economic inequalities manifest itself in the form of an ecological crisis denying the poor and the marginalised right to a sustainable livelihood. A meaningful incorporation of environmental justice principles requires due recognition of the pluralities of different groups. Climate justice is one of the most important dimensions of environmental justice today. However Schlosberg, 2004 argues that claims for climate justice have been restricted to distribution of environmental goods between nation states; and deconstruction to local level still remains to be done. The political space for climate justice claims has excluded the diverse experiences of communities and individuals with climate vulnerability, second-order effects of climate policies, and interacting spheres of inequality (Fisher, 2014).

Damodaran, 2010 enunciates that "global public goods are important to local communities as they are the beneficiaries of their preservation as also the victims of their destruction". Wayanad district in Kerala is characteristic of a typical rural agrarian economy with majority of its livelihoods dependant on climate sensitive sectors and a significant percentage of indigenous population (Kumar & Srinath, 2011). It is an ideal representation of a landscape that can depict precise interactions of environment and society under conditions of normal life and also under pressure. Distribution of environmental entitlements, extend of exposure to various environmental hazards, as well as incidence of environmental protection is being increasingly defined by forms of hierarchy and exploitation along the line of race class and gender (Newell, 2005). In this context using Wayanad as a case study, the chapter examines the

interacting spheres of socio-economic and environmental inequalities where the social responses to a natural triggering element shape and reshape social stratifications and the distribution of risks producing new inequalities (Marino & Ribot, 2012). The field research is conducted with a special focus on the indigenous groups in Wayanad who are now facing a livelihood crisis; an outcome of additional challenges faced in the form of environmental degradation and climate variability, acting on their heretofore vulnerable means of subsistence.

5.2 Why Wayanad?

Lately there is an increasing recognition among ecologists and policy makers that the most critical dimension of environmental sustainability is the local one. Wayanad district in Kerala represents a typical rural agrarian landscape in India with majority of its livelihoods dependant on climate sensitive sectors (Kumar & Srinath, 2011). It has a unique social structure with the highest percentage of indigenous groups in Kerala, a low sex ratio and a fragile ecosystem (Indian Institute of Management (IIM), 2006). Bulk of Wayanad's population consists of small and marginal farmers. (Kumar & Srinath, 2011). "*The geographic setting of Wayanad makes it highly sensitive to environmental stresses"*(Santhoshkumar and & Ichikawa, 2010, pg.1). It is a part of the bio cultural diversity hotspot Western Ghats, which was recently declared as one of the UNESCO Natural World Heritage sites (Betz, Kunze, Prajeesh, Suma & Padmanabhan, 2014).

Ellis 1993 notes that most often rural livelihoods in developing countries have been ironically depicted as perilous and extremely robust. This is can be attributed on one hand to the primary dependence on eco systems

and on the other hand to the faith in immense traditional knowledge possessed by these communities that enables them to withstand climate and environmental variations. Wayanad is one such example with farmers traditionally maintaining different varieties of crops in their farmlands. In spite of this robustness, Wayanad's economy and ecology is precarious because of the fragmented land holdings, climate dependence, change in land use patterns, price fluctuations of major agricultural commodities, tribal impoverishment, government legislations, and neo liberalisation of nature and fortress model of conservation practiced (Indian Institute of Management (IIM), 2006; Nair, Vinod & Menon, 2007).

Arpke et al., 2013 diagnoses three pillars of sustainability in Wayanad; environment, agriculture and social organisation. The potential resilience to any form of livelihood degradation in Wayanad is defined by these three elements that are entangled in a complicated web of overlapping choices *(ibid)*. A majority of Wayanad's rural population and indigenous groups are dependent on the agro and forest based ecosystem services for their food security and livelihoods (Santhoshkumar and & Ichikawa, 2010). In recent times the rural agrarian landscape of Wayanad is undergoing rapid transformations like land use conversions, de-agrarianization, soil degradation, price shocks etc. (Betz et al 2014). Münster D & Münster U, 2012 argues that capitalist agrarian change and neo liberalisation of nature in Wayanad has created a fragile landscape through degradation of natural forests and decline in the quality of its agro ecosystem their by endangering the cultural relations revolving around the same.

The current state of Wayanad is a typical illustration of the debilitated rural livelihoods in globalised India with the poor and the marginal

farmers facing the acutest of threats. The years 2005 and 2006 witnessed farmer suicides in the district and very often the persons who committed suicide belonged to the lower strata of the society like agricultural workers and marginal farmers (Münster, 2012). The process of socio economic exclusion at work in globalised India is evident in the case of the adivasis of Wayanad (Shrivastava & Kothari, 2012). Food, firewood and fodder which were available in plenty from the local commons are no longer freely available for the tribes; an outcome of the neo liberal mode of conservation (ibid). Boyce argues that aspects of environmental quality lies between the public and private terrains and social decisions on environmental protection favour some individuals over the other conditioned by power differences (Boyce, 2002). Land ownership is an important indicator of inequality and power differences in Wayanad. While there are numerous cases of tribal land alienation by settler peasants most of these are not effectively tracked and action taken. "Kerala forest department statistics reveals that 5.49% of the districts tribals are landless and 47.8% own less than 50 cents of land"(Vishnudas & Munster, 2012). Despite the continuing struggle for land rights by politicized adivasis the commodification of Wayanad's nature continues (Münster D & Münster U, 2012).

Wayanad presents a compelling case "*of the ecological and social havoc unleashed by the so called liberalised development in rural India*"(Shrivastava & Kothari, 2012 pg.35) . In this light the differential impacts of environmental change on various communities in Wayanad can be examined through an environmental justice perspective.

5.3 Climate Trends in Wayanad

One of the key features of Wayanad's climate was its predictability. The climatic conditions of Wayanad were closely interlinked with its cropping patterns and socio-cultural relations (Kumar & Srinath, 2011). "Four seasons are identified in Wayanad; winter (December to February) is usually misty with very little rainfall, summer (March-May) is partially dry with sharp pre-monsoon showers in the afternoon, south west monsoon (June-September) with torrential daily showers, north-east monsoon (October-November), which is a secondary rainfall season with intermittent rain and high humidity" (ibid).

One of the earliest accounts of Wayanad's climate can be found in the Malabar Manuel by William Logan (Logan 2000). Logan reports that climate was very precise and sharp in 1887. He mentions about the uniformity of temperature throughout the year. The mean annual temperature was 27 degree Celsius. It hardly rises above 32 degrees and falls below 21 degree Celsius.

State Action plan on Climate Change in Kerala has listed Wayanad as a climate change hotspot with its vulnerability to droughts, landslides, etc. (Nandakumar, 2014). Agriculture in Wayanad like much of rural India is a gamble with the monsoons (Kumar & Srinath, 2011). Wayand receives bulk of its rain from the South West monsoon which has profound influence on agricultural outputs throughout the year.

Given below is the plot for average rainfall received yearly from the South West monsoon and yearly from various stations in Wayanad for the time period 1901-2011[i].

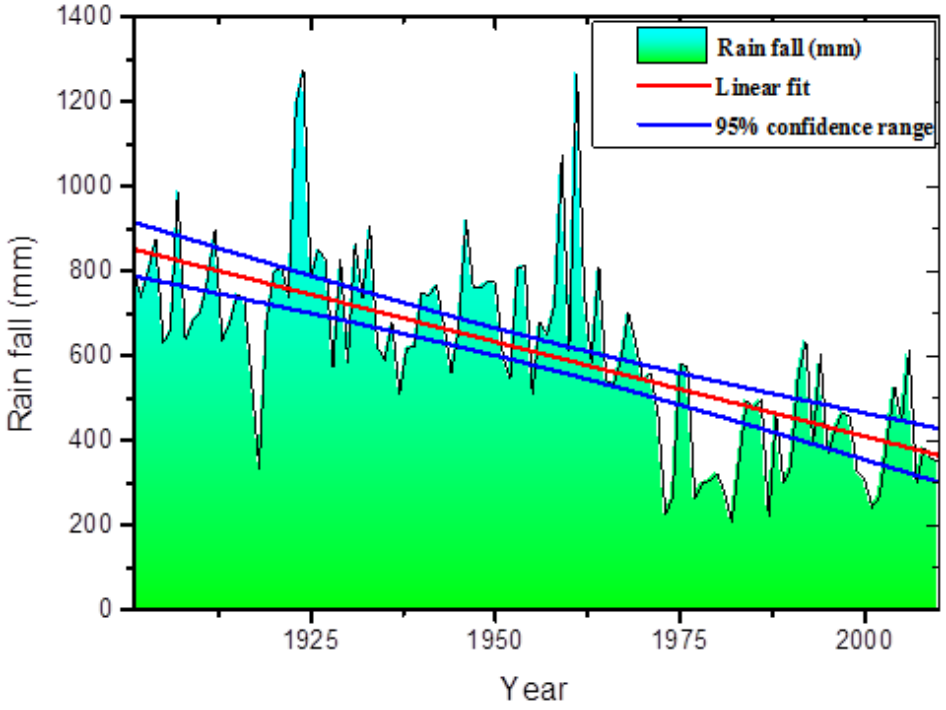

Figure 5.1: Rainfall received in Wayanad from South West Monsoon (1901-2011) (Source: IMD Data Base: 1901-2011)

The trend line shows continuous decline in the rainfall received from South West monsoon with a sharp decrease noted around the early 70s. The rainfall decreases annually at a rate of -4.47±1.17 significant at the 95% confidence range. The annual rainfall decreases at a rate of 20.62± 4.21mm significant at the 95% confidence level.

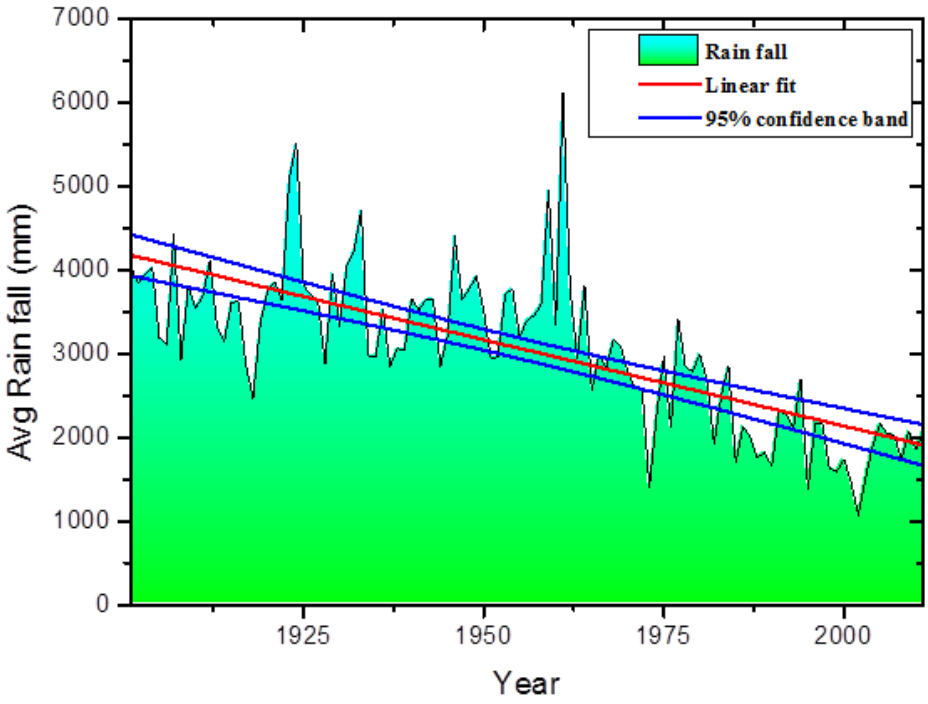

Figure 5.2: Total Rainfall in Wayanad (1901-2011)

The decadal plots are a clear indication of the transition towards a drier climate regime in Wayanad. This is consistent with the field observations and other documented studies that depicts droughts as the most prominent climate threats in Wayanad . Since majority of Wayanad's agriculture is rain fed, the steady decline in rainfall is leading to a severe livelihood crisis for the small scale and marginal farmers.

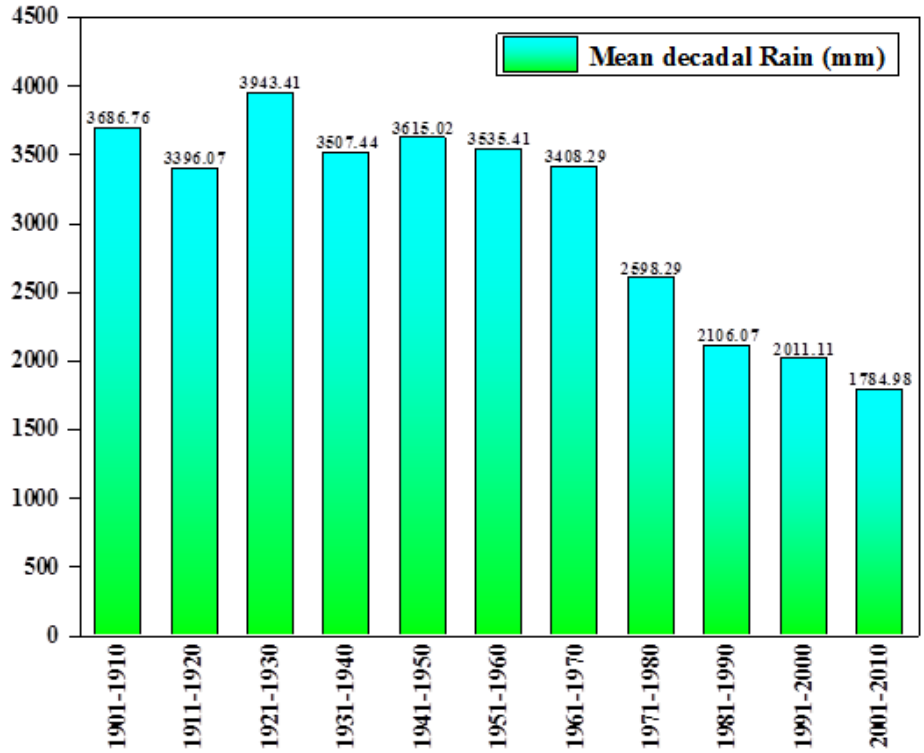

Figure 5.3: Decadal rainfall plot in Wayanad

Rise in maximum and minimum temperatures was also noticed for the past 49 years over Kerala, including Wayanad (Rao G, Rao A, Krishnakumar, & Gopakumar 2009). They noted a day-time maxima increase of 0.64° C, and a more modest increase of 0.23°C in the night time minimum temperature. Srinath & Kumar, 2012 document that Wayanad is likely to witness increased intensity of droughts and pest attacks. Increased pest attacks is attributed to the increase in diurnal temperature (difference between day and night time temperature) range in Wayanad (ibid).

Climate variability is a critical defining factor for crop selection.

Nagabhatla, Sahu, Gaetaniello, Wen, & Lee, 2014 notes that temporal variations in rainfall and temperature is a key determinant of change in land use practises in the context of small scale rain fed agriculture . Gaetaniello, Nagabhatla, Shreejaya, & Prasad, 2013 noted a significant correlation between rainfall variability and rice production in Wayanad. They argue that *"decreased rainfall, reduction of groundwater recharge, lack of water availability due to increased water runoff are central deciding factors that govern the transformation of paddy fields to other crops. Production of rice showed a positive, moderate and significant correlation with rainfall"*. Nagabhatla et al., 2014 argues that decline in rice production shows a considerable degree of correlation with fluctuations in diurnal temperature range in Wayanad. Thus variations in temperature and rainfall played a crucial role in the progressive disappearance of paddy from Wayanad's agriculture (Gaetaniello et al., 2013). While the transformation from a staple food production centred economy to a region of cash crops and plantations was noticed in 1970s, a more steep decline was noticed recently when the area under paddy declined to less than 10,000 ha in 2011-2012 from 30,000 ha in 1985-86 (ibid). The decline of paddy cultivation and deforestation activities have heavily hindered much of the ecological services (such as soil accumulation, water retention, pollution absorption, floods and landslides protection) in the region and these dimensions are likely to worsen the impacts of environmental change on Wayanad (Gaetaniello et al.,2013; Nagabhatla et al., 2014)

5.4 Land use change In Wayanad

Wayanad once known as the land of rice experienced a major shift in cultivation patterns where the paddy based agro ecological system was

replaced by a cash crop dominated economy. Land use change in Wayanad is driven by a combination of environmental change, climatic conditions,socio economic pressure as well as changing mind set of farmers in Wayanad (Nagabhatla et al., 2014). Véron, 2001 notes that the paddy based agro ecological system has characteristics of public and private good that land rights fail to capture.

The paddy fields of Wayanad also consisted of variety of leafy greens, wild food, medicinal plants, fish, crustaceans, crabs, snails etc. that are crucial for food security (Padmanabhan, 2005). The changing agro ecological system of Wayanad has had its impacts on all sections of the society. The ability to build resilience to land-use change depends on the ways, in which external and internal factors influence social and ecological functions of the system in Wayanad. The current trends in land use change have affected both the land owning and landless indigenous groups. The socio economic relations of Wayanad are directly and indirectly influenced by the state of agro bio diversity. "*They are directly related with rural livelihoods and management of natural capitals, making the human-nature (or social-ecological) interaction central"* (Gaetaniello, 2013). However as argued above vulnerability to an external stress or changing conditions is an outcome of insecure livelihoods and unequal access to resources. This is evident from the way different groups of farmers have adapted to the crisis generating elements like climate variability, price shocks, environmental degradation etc. Observations from the field research and review of published literature reveal that rural elites or rich farmers in Wayanad diversified their crops. The elites could afford crops with high production costs like ginger vanilla cashew etc. (Nair et al., 2007). Most of the elites invested in huge plantations acquired both

legally and illegally. This led to decline in the total cropped area of Wayanad by almost 20% between 2006-07 (its peak year) and 2011-12 (Gaetaniello, 2013). For the small and marginal farmers even though they practised crop diversification the scope was limited. They mainly changed into pepper and banana which suffered from huge price shocks and pest attacks. Münster D & Münster U, 2012 reported that drought and flood caused heavy loses to small and marginal farmers in Wayanad since the year 2000. As far as the agricultural labourers are concerned there was a huge decrease in the labour days. While the rich farmers adopted more mechanised farming techniques, the small and marginal farmers relayed on family labour. They were mostly driven into unskilled non-farm sector jobs and distress migration with far reaching consequences. The implications of the land use change on different social groups have been summarised in a tabular form below.

Table 5.1: Implications of land use change for different groups

Groups	Rich Farmers/Elites	Small/Marginal Farmers	Agricultural Labourers
Adaptation Strategies	1)Crop Diversification-Ginger, vanilla and Cashew 2)Plantation agriculture-acquired land legally and illegally 3)Real Estate and Tourism	1)Crop diversification-pepper, banana 2)Sustain paddy production for self-consumption	1)Distress Migration and unskilled non-farm sector jobs
Fall Back Mechanisms	Adequate	Limited	Absent
Net Effect	Majority report decline in their incomes. However around 20% of the elites who retorted to real estate and tourism reports increased incomes	Declining Incomes, sale of landed assets, indebtedness	Livelihood crisis as a combination of food insecurity, lack of purchasing power

The indigenous tribes were the primary actors in the paddy based agro ecological system and land use changes had profound influences on the livelihoods of the indigenous tribes which are explained in detail below.

5.5 Field Research

The majority of the small scale indigenous society has been ecologically based. Environmental change presents an additional challenge to the indigenous communities by increasing the risk of managing natural resources and maintaining agricultural productivity, which are crucial elements of their survival and livelihood sustenance. To complement the macro analysis of Wayanad's vulnerability a field study was conducted among three tribal communities in Wayanad namely Kurichia, Paniya and Kattunayaka to capture precise interactions of environment and society at the pressure points where livelihood crisis slowly starts to unravel (Wisner et al.2003).

The data were collected using a semi structured questionnaire covering 100 households. Taking into account the practical challenges of conducting a filed survey among the *adivasis,* snow ball sampling technique was used. Discussions were also made with tribal development officers and forest department officials. The study area was spread across the tribal hamlets in the villages of Noolpuzha Panchayat[ii]. The Noolpuzha village is the only village in Wayanad with the *adivasis* forming 50% of the total population (Indian Institute of Management (IIM), 2006). Chekady village popularly known as the rice bowl of Wayanad in Panamaram Panchayat Mananthavady, was also visited to get an insight into the paddy based agro ecological system of Wayanad. Kurichia and Paniya are among the primary actors in the paddy based agro ecological system (Betz et al., 2014). The Paniya also have a strong interdependence on the forests. The Kattunayakas belong to the category of primitive tribes and a majority of the households are still dependant on honey and

other minor forest produce collection for their livelihoods. The changing cultivation patterns in Wayanad had profound influences on the indigenous groups in Wayanad (ibid). However, the inter community differences have been significant here and differences in their vulnerability and resilience reflects an initial distribution of the endowments before the onset of the livelihood crisis.

The vulnerability of a community to any environmental stress can be gauged as a direct function of the entitlements possessed by the same. Entitlements are defined "*as the actual or potential resources available to individuals based on their own production, assets or reciprocal arrangements"* which enables them to adapt or cope to an emerging livelihood threat (Adger, 2006). Derived from the entitlements approach the concept of environmental entitlements refers to benefits derived from the direct use of environmental goods like food, water and fuel, the use rights etc which can be defined as *"the alternative sets of benefits derived from environmental goods and services over which people have legitimate effective command and which are instrumental in achieving well-being"*. (Forsyth, Leach & Scoones, 1998)." However access to environmental entitlements is conditioned through the social processes that determine distribution of wealth and power in a society. Unequal power structures are the major threat in accessing sustainable livelihood options for the poor and the marginalised. In this context vulnerability has to be determined by existing capacity rather than predicted future impacts (Ribot, 2009).

The damages associated with environmental hazards like climate change is shaped by socio-political and economic environments. (Ribot, 2009; Wisner, Blaikie, Cannon & Davis, 2003). Ribot 2009 argues that differentiated outcomes of climate variability or environmental hazards at

the same place and at the same time reflects on ground social inequalities and unequal access to resources.

In this manner vulnerability has to be examined as a new pathology that combines biophysical perspectives with socio economic and ethnic perspectives. Here a livelihood and entitlement approach to vulnerability, analyses access to material and non-material resources which are crucial elements that determine the adaptive capacity and resilience of livelihoods.

"A livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living; a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels in the short and long-term" (Chambers & Conway, 1992, p. 7). The Livelihood Vulnerability Index (LVI) is based on the on the Sustainable Livelihood approach promoted by DFID that identifies five core asset categories namely human, social, physical, natural and financial (DFID, 1999; Hahn, Riederer, & Foster, 2009; Lamichhane, 2010). The Livelihood Vulnerability Index used here is adapted from Hahn, Riederer, & Foster, 2009; Lamichhane, 2010. The LVI based on five livelihood asset categories is used to capture the differential livelihood vulnerabilities of the three tribal communities Kattunayaka, Paniya and Kurichya. While the general practise is to use the LVI to analyse the vulnerability associated with a place, here it is specifically used to analyse the livelihood vulnerability associated with different communities residing at the same place at the same time.

The LVI used here most importantly provides an analytical framework on what is and what can be done and provides a holistic approach to sustainability by realising the interdependence of various capitals. The LVI index uses a balanced weight approach where each sub component contributes equally to the core component and each core component contributes equally to the overall index (Hahn, Riederer, & Foster, 2009b). Each index has been calculated based on the formula

$$Index = \frac{(I_{obs} - I_{min})}{(I_{max} - I_{min})}$$

Where I_{obs} refer to observed value, I_{min} the minimum value and I_{max} the maximum value of the subcomponent. Those variables that measure frequencies like percentage of households without drinking water facilities minimum value is set at 0 and the maximum value at 100.The range of LVI lies between 0-1; 0 denotes the position of least vulnerability and 1 denotes the highest point of vulnerability. The data for the construction of Livelihood Vulnerability Index has been obtained from the field research and secondary data sources collected from Tribal Welfare Offices. A detailed table listing the subcomponents and the associated values of the vulnerability index is given in the appendix.Given below is a detailed description of the results from the five capital approach.

5.5.1 Human Capital Vulnerability

DFID defines human capital as "the skills, knowledge, ability to labour and good health that together enable people to pursue different livelihood strategies and achieve their livelihood objectives" (DFID, 1999). The development of other capitals are contingent upon human capital as a basic requirement (Lax & Krug, 2013).

Human Capital Vulnerability is highest for the Paniya group. 82% of the surveyed Paniya households and 76 % of the Kattunayaka households reported severe food security challenges due to the loss of their traditional food culture and disappearance of wild edible greens. Lack of nutritious food and persistent use of intoxicants are also responsible for the poor health status in Kattunayaka's and the Paniya's.

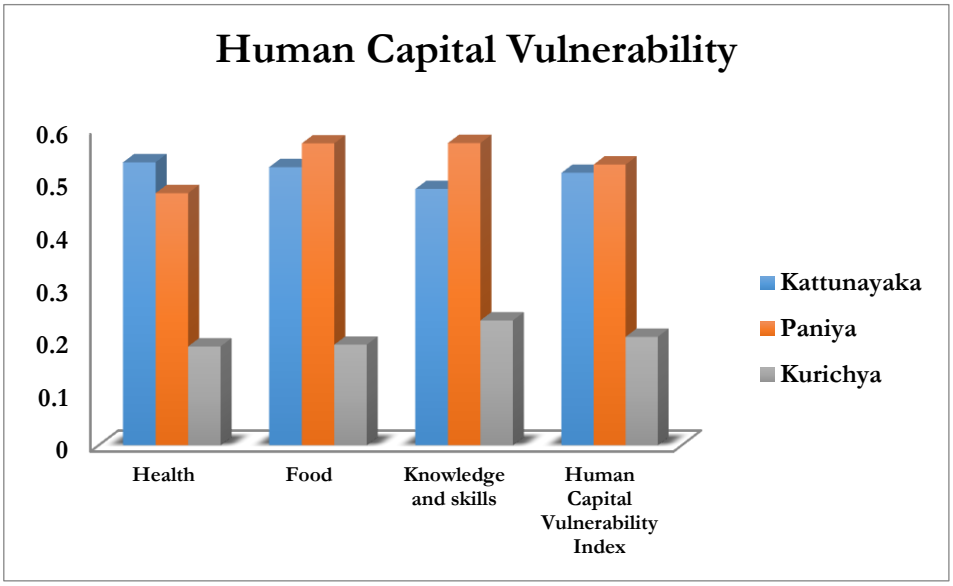

Figure 5.4: Human capital vulnerability

Despite easy access to schools, illiteracy and dropout rates are very high among these two communities. However the Kurichyas appear to be the beneficiaries of a lot of tribal welfare programmes with adequate skills for livelihood diversification and integration with the mainstream economy, reflected in their low human capital vulnerability. It has been noticed that the quotas for tribals in higher education institutions has been monopolized by them (Indian Institute of Management (IIM), 2006).

5.5.2 Physical Capital

DFID defines physical capital as "the basic infrastructure and producer goods needed to support livelihoods"(DFID, 1999) . Access to physical capital is a critical determinant of people's productive capacity and when seen in the context of opportunity costs it provides time as a resource for capacity building or self-enrichment and gaining access to the market (Lax & Krug, 2013).

Physical capital vulnerability is highest for the Kattunayaka community as their houses are located in close proximity to the forests. Hence their living conditions are generally vulnerable without proper housing conditions. Household energy use presents a picture of severe energy injustice in the Paniya and Kattunayaka households with majority of the households dependent on firewood. This also has severe implications on the time use and health status of these households. The Kurichyas show the least vulnerability and their access to physical capital is comparable to the mainstream communities.

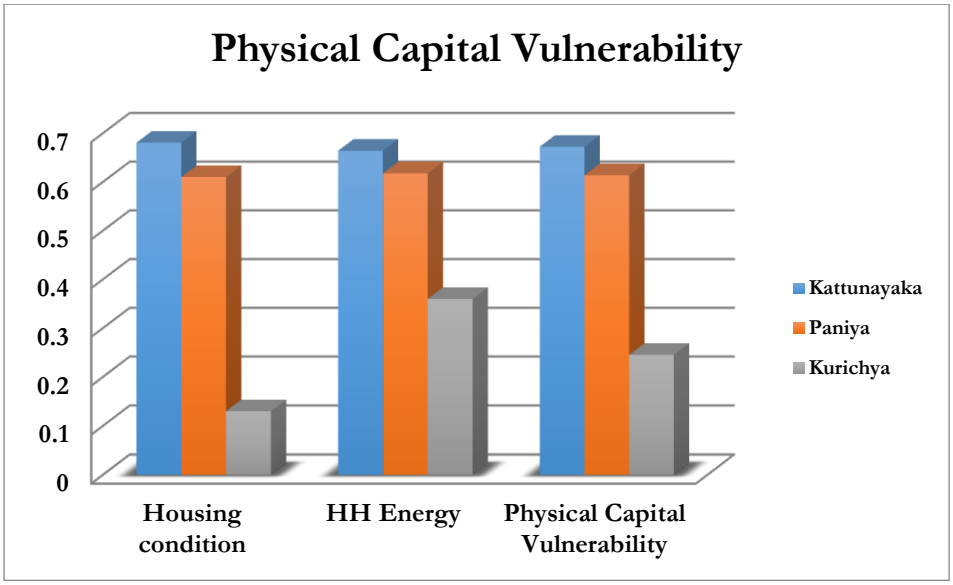

Figure 5.5: Physical capital Vulnerability

5.5.3 Financial Capital

Financial capital denotes the financial resources that empowers people to adapt to different livelihood adversities (Lax & Krug, 2013). It is an important determinant of livelihood diversification as well as a critical element of "*purchasing private insulation from public bads"* (Boyce, 1994). The financial capital vulnerabilities are also highest for the Paniyas and the Kattunayakas. The Paniya and the Kattunayaka households are dependent on primary resources for their income and employment opportunities. Hence natural resource degradation and environmental change has telling impacts on their livelihood. They are also not adjudged credit worthy by the markets. Per contra the Kurichyas are more educated, possesses significant traditional knowledge and thus have immense possibilities for livelihood diversification.

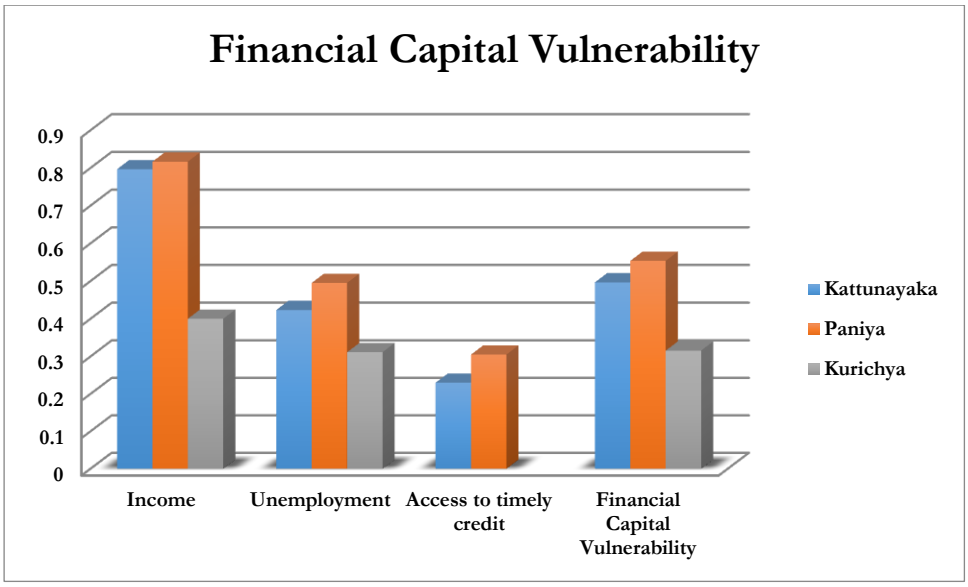

Figure 5.6: Financial Capital Vulnerability

5.5.4 Natural Capital

Natural capital is defined by DFID as "the natural resource stocks from which resource flows and services (e.g. nutrient cycling, erosion protection) useful for livelihoods are derived" (DFID, 1999). Natural capital is a critical requirement for the livelihoods of resource dependent communities studied here. Climatic changes are experienced by all the communities. But the extend of harm associated with it is dependent upon access to other forms of natural capital. Land is a critical asset that gauges the adaptive capacity of various communities. 96% of the Kattunayakas and 74% of the Paniyas own less than 5 acres of land which is generally unirrigated. The land owned by Kattunayakas are generally in close proximity to the forest lands and hence susceptible to crop raiding and other livelihood hazards by wild animals. Forest dependence is also high in the Kattunayaka community followed by the

Paniyas and hence forest degradation significantly affects their livelihoods.

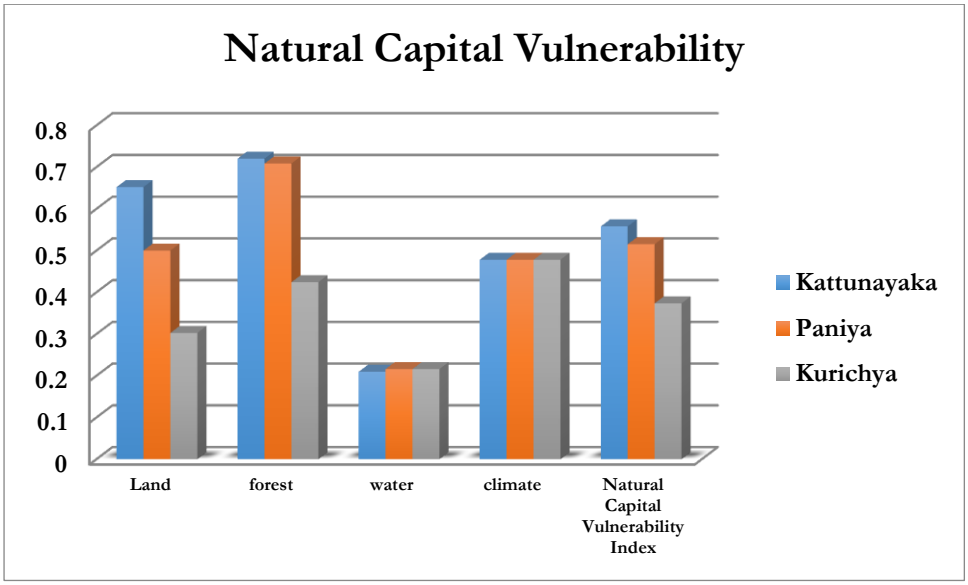

Figure 5.7: Natural Capital Vulnerability

In contrast the Kurichyas are traditionally a landowning community and they have shown significant adaptive capacity in the wake of climate challenges. More than 30% of the Kurichya and 40% of the Paniya and Kattunayaka community reported drinking water shortages.

5.5.5 Social Capital

Social capital is defined as "the shared knowledge, understandings and pattern of interactions which comprises of network and connectedness, membership of formalised groups, informal safety nets etc. that a group

of people bring to any productive activity". (DFID, Coleman 1998, Putnam et al 1993). Socially capital is actively required for all the other forms of capital.

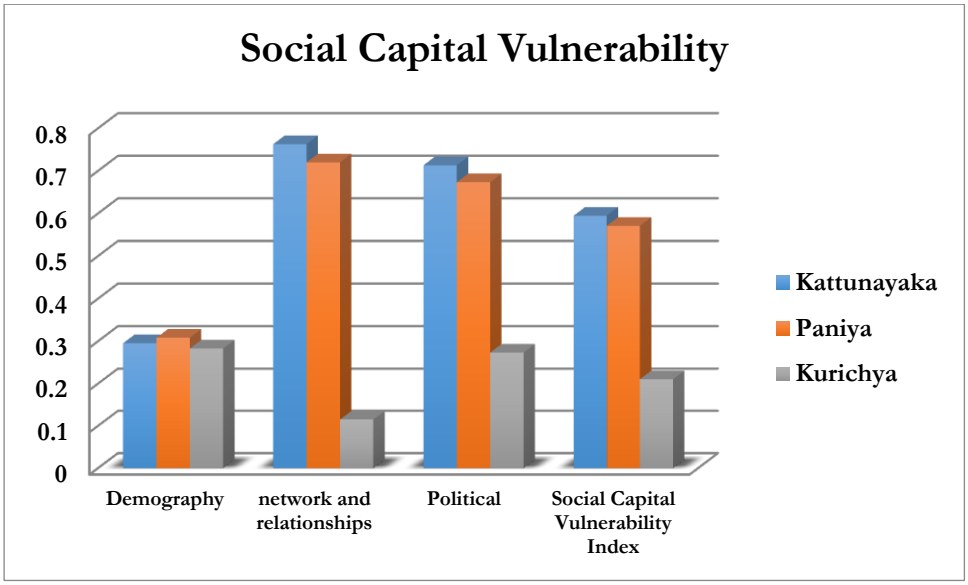

Figure 5.8: Social Capital Vulnerability

While the demographic features of vulnerability like dependency ratio, female headed households etc. are largely similar for the three groups, Kattunayaka and Paniya are severely constrained in their networks and relations, reporting the least participation in self-help groups and community managed resource activities. Lack of political participation is also a significant indicator of their invisibility in decision making structures. However the Kurichyas are adequately represented in various forums for tribal welfare as well as in local level planning initiatives. They also actively participate in community managed self-help groups and

draws immense benefit out of all Adivasi welfare programmes.

5.5.6 Livelihood Vulnerability Index

The results of the Livelihood Vulnerability index also reveals the importance of recognising community identities which often surpasses the generalised identity 'adivasis' or tribals (Indian Institute of Management (IIM), 2006). Wisner et al. (2003) developed a Pressure and Release model to analyse how vulnerability arises when exposed to certain natural hazards.

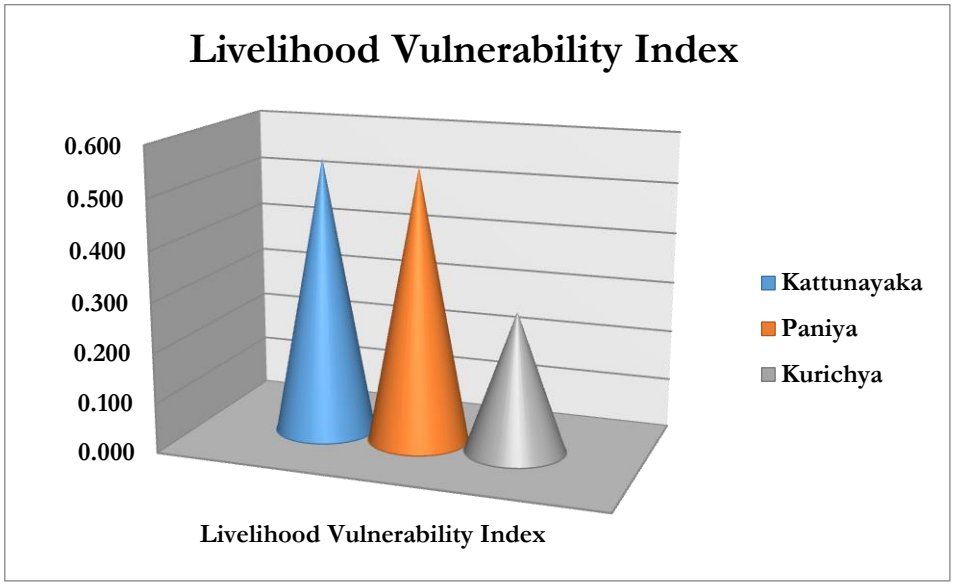

Figure 5.9: Livelihood Vulnerability Index

According to the Pressure and Release Model a disaster unfolds when those processes generating vulnerability on one side interacts with a natural hazard or sometimes a slowly unfolding natural process like climate variability or environmental change on the other side (ibid). The PAR model notes that vulnerability is a combined outcome of three

causal factors namely the root causes, dynamic pressures and unsafe conditions. The root causes are generally economic, demographic and political which basically reflects the exercise and distribution of power in a society. In the case of Wayanad the root causes of vulnerability can be traced back to the colonial period when the British spearheaded the dispossession of land from its customary users and opened up the possibility of tea and coffee plantation economy (Indian Institute of Management (IIM), 2006). It is also argued that a century back majority of the population in the district comprised of the Adivasi communities. As the settler peasants migrated from the plains in increasing numbers the adivasis were reduced to a minority (Raghavan 2011,Gaetaniello, 2013, Indian Institute of Management (IIM), 2006).

The high livelihood vulnerability associated with the Paniyas and Kattunayakas have historic origins as well. Paniyas were traditionally bonded labourers involved with paddy cultivation. The field study revealed that despite being the beneficiaries of land distribution schemes by the government a group of Paniya households left their land barren just because they were clueless on what could be done. This seems to be correlated with the historic relations and structures of domination which basically reduced them to a group that can only obey orders. The Kattunayakas are largely a secluded group reliant on a pre-agricultural economy. They led the life of hunters and gatherers and were basically a self-sufficient community completely based on the forest based ecosystem services until the beginning of the last century (Indian Institute of Management (IIM), 2006). However, they had limited or no interaction with other tribal communities as well as the mainstream society. This more or less made them a closed group with little access to

support networks. On the contrary, Kurichyas were traditionally landlords possessing immense traditional knowledge of various rice cultivation practises like drought resistant varieties of paddy seeds etc. Despite their dependence on agriculture they had access to socio economic networks which made them a historically resilient community.

Dynamic pressures are those that translate the effects of effects of root causes temporally and spatially into unsafe conditions (Wisner et al., 2003). Dynamic pressures on Wayanad like rapid transformation from a paddy based agro ecological system to a plantation economy had severely affected the livelihoods of the Paniya community. The livelihood of Paniyas chiefly revolved around the paddy based agro ecological system. They also have strong dependence on the forests. They were traditionally working as agricultural labourers. Their food requirements were met from the wild edible greens, crustaceans etc. found along the paddy fields. However the changing land use patterns in Wayanad have had significant impacts on their food security and employment opportunities. Despite the younger generation being largely de-tribalised they are not still integrated into Wayanad's plantation economy and have also not taken advantage of the educational opportunities made available to them.

The livelihood requirements of the Kattunayakas are closely integrated with the forest based eco system of Wayanad. A part of the community lives inside the reserved forest and majority of them lives on the fringes of forest lands. Forest degradation and implementation of the forest right acts had serious implications on their livelihood activities.(Chemmencheri, 2013). However despite the implementation of the Forest Rights Act participation of the indigenous groups like the Paniyas and Kattunayakas remained titular. The fortress model of

conservation followed in Wayanad also restricted the indigenous groups like Kattunayakas and Paniyas of their access to non timber forest products like honey,amala,kalpasham etc. During the field hearings most of the forest dependant tribal communities namely the Kattunaikans and Paniyas expressed apprehension regarding their restricted access to forest produces. Also of concern was the fact that the sale of Non Timber Forest Products were now regulated through societies created by the forest departments.

The impacts of climate variability have been noticed in the form of declining honey yields for the Kattunayakas. Honey collection is major source of livelihood for them. The marked decline in minor forest products transformed them forced them as agricultural laborers to settler farmers (Indian Institute of Management (IIM), 2006). One of the respondents commented that 10 years ago honey collected from a single hive was around 100 kg but now it has fallen to 20-30 kg per tree. The decline in honey yields in Wayanad is attributed to the erratic rainfall patterns. Majority of the Kattunayakas and Paniyas also report fall in the availability of other non-timber forest products. The changing land use patterns have also affected the Kurichya community. However during the field study it was noticed that majority of them still retained paddy cultivation for self-consumption and still actively maintains the cultural, medicinal, dietetic, and ecological value of different rice varieties (C.M; Sivadasan & Kumar, 2003). They also enjoy a good representation in tribal planning boards and have good access to protective safety networks. Unsafe conditions refer to living in hazardous locations, fragile landscapes, having minimum food entitlements lack of social networks, adequate knowledge and support to changing circumstances among

others (Wisner et al., 2003). Thus when dynamic pressures operate on the root causes the vulnerable groups like Kattunaikans and the Paniyans are subjected to inadequate livelihoods which are not resilient in the face of shock. Despite severe stresses to the traditional livelihood activity associated with paddy cultivation, the Kurichyas have exhibited transformative resilience capacity by diversifying their livelihoods and taking advantage of the welfare programms and development initiative of the state. Thus it can be argued that social systems create the conditions in which hazards have a differential impact on various societies and different groups within a society. The impacts of environmental degradation or change are mediated through the existing social relations and structures of domination. The 'Release' aspect of the PAR model outlines that for the vulnerabilities associated with a triggering natural phenomenon cannot be addressed by analysing the unsafe conditions of present vulnerability; "the entire chain of causation needs to be addressed right back to the root causes"(ibid) .

5.6 Conclusion

Boyce argues that the social dynamics that determines unequal exposure to environmental hazards revolves around the axis of wealth and power. Wayanad is a fitting representation of the multiple ecological crisis that confronts neo liberal India (Shrivastava & Kothari, 2012). Relatively self-reliant rural communities have undergone an overnight transformation to callously abused people, the worst sufferers being the indigenous groups.

The indigenous groups of Wayanad were entirely dependent on the agro forest ecosystems whose degradation has reinforced the marginalisation of these groups. The chapter has rightly demonstrated that vulnerability

to environmental change does not exist in isolation from the wider political economy of resources use. "Vulnerability is driven by inadvertent or deliberate human action that reinforces self-interest and the distribution of power in addition to interacting with physical and ecological systems"(Adger, 2006 p.270). Unequal power structures become the major threat in accessing of sustainable livelihood options for the poor and the marginalised. These inequalities are perpetuated by the free market "environmentalism" doctrine which according to Naidu & Panayiotis, 2010 is "fraught with the contradictions of capitalist development leading to economic growth at the cost of land dispossession, the loss of access to natural resources, and human relationships with the environment". Münster & Münster (2012) notes that Wayanad has recently embraced neo liberalisation of its nature transforming it into a marketable asset. They argue that the sell-out of Wayanad's paddy based agro ecological system to that of a chemical intensive cash crop economy and replacement of natural forests with teak monocultures are attempts at commodification of nature. Commodification of nature renders it possible to alienate certain groups of people from accessing it. This perpetuates environmental injustices producing uneven developments, marginalised landscapes and threatened livelihoods.

The case study of Wayanad has demonstrated that environment is expressive of social relations and hence it has to be upheld as a social justice issue. The livelihood vulnerability analysis of three indigenous groups drawing upon the five capital approach has illustrated the importance of assets and entitlements to cope with or adjust to environmental variations and climate change. As depicted by the

Livelihood Vulnerability Index the Kattunayakas and Paniyas lack resources and entitlements that enable them to control their destinies" (Adger, Barnett, Chapin & Ellemor, 2011). On the other hand the Kurichyas are comparatively resilient to the changing environment in Wayanad and are successfully practising different ways of diversifying their livelihoods. It can be argued that while vulnerability to environmental hazards is an outcome of the way power operates in a society through socio economic and political processes, environmental change on the other hand presents additionally challenges to rural agro-ecological societies limiting their functionings (Wisner et al., 2003). Thus as Schlosberg argues a meaningful climate justice discourse should be rooted in "the recognition of the relationship between those vulnerable and the way climate change changes their everyday lives-individually, socially and culturally"(Schlosberg, 2012).

5.7 Endnotes

i Rainfall data from various stations such as Ambalavayal, Muttil, Vythiri, Mananthavadi and Choondayil were used to arrive at average rainfall figures for Wayanad district.

ii The Pookuzhy Kattunaikan settlement,Pushpathur and Puthannur Paniya settlement,Poonthottam, Pulimunda and Pulkode Kurichya settlements were covered.

5.8 Appendix

Table 1: Human Capital

capitals	components	subcomponents	Vulnerability Index		
			Kattunayaka	Paniya	Kurichya
human	health	Average distance (time) to nearest health centre	0.666	0.111	0.1
		HH without primary health care facilities	0.456	0.456	0.085
		hamlets without Govt. health services	0.343	0.343	0.085
		hamlets which do not have traditional health practitioners	0.58	0.75	0.52
		people suffering from mental physical illness and permanent diseases	0.62	0.58	0.32
		HH without toilet	0.545	0.62	0.01
	Vulnerability Index: Health		0.535	0.476	0.187
	food	HH not getting enough food	0.763	0.82	0.1
		HH gathering food traditionally	0.358	0.48	0.06
		deaths due to food shortage	0.002	0.002	0
		HH without home garden	0.98	0.98	0.6
	Vulnerability Index: Food		0.523	0.571	0.19
	knowledge and skills	literacy rate (inv)	0.389	0.44	0.152
		secondary and higher education (inv)	0.82	0.8	0.5
		dropout rates	0.114	0.516	0.157
		HH having traditional knowledge (inv)	0.68	0.7	0.35
		Radio & TV(inv)	0.42	0.4	0.02
	Vulnerability Index: Knowledge and skills		0.484	0.571	0.236
Human capital Vulnerability			0.515	0.530	0.205

Table 2: Physical capital

Physical	housing conditions	Kucha HH	0.68	0.67	0.08
		HH without road facilities	0.682	0.55	0.18
	HH energy	HH without electricity	0.343	0.25	0.02
		HH depending on firewood for cooking	0.986	0.986	0.7
	Physical Capital Vulnerability		0.672	0.614	0.245

Table 3: Financial Capital

financial	income	HH reporting local income source	0.88	0.9	0.1
		HH reporting collectively owned community assets	0.73	0.75	0.9
		HH reporting low MPCE	0.78	0.8	0.2
	Vulnerability Index: Income		0.797	0.817	0.4
	employment	People reporting unemployment	0.59	0.65	0.2
		Avg. labour days in an year	0.524	0.476	0.476
		HH whose employment is only based on forest	0.16	0.05	0.02
		HH whose employment is only based on agriculture(including agriculture lab)	0.73	0.95	0.8
		HH reporting migration	0.113	0.35	0.06
	Vulnerability Index : Employment		0.424	0.495	0.311
	loans	HH reporting loans outstanding for the last 10 years	0.31	0.36	0.15
		HH reporting loans from local money lenders	0.15	0.25	0.25
	Vulnerability Index : Loan		0.23	0.305	0.2
Financial Capital Vulnerability			0.497	0.554	0.316

Table 4: Social Capital

Social	Demography	dependency ratio	0.5	0.57	0.64
		female headed HH	0.111	0.113	0.081
		family size	0.45	0.5	0.4
		unwed mothers and widows	0.12	0.05	0.01
	Vulnerability Index : Demography		0.295	0.308	0.283
	network and relationship	HH reporting a stable support system(inv)	0.86	0.88	0.2
		HH without any self-help group participation	0.924	0.7	0.050
		HH not reporting any Govt. assistance	0.24	0.3	0.105
		HH belonging to dis advantage community	1	1	0
		HH without proper warning systems	0.79	0.72	0.22
	Vulnerability Index : Network and relationship		0.763	0.72	0.115
	political	HH participating in electoral process	0.48	0.42	0.12
		HH without job cards	0.675	0.65	0.65
		members in co-operative societies (inv)	0.985	0.95	0.05
	Vulnerability Index : Political		0.713	0.673	0.273
Social Capital Vulnerability			0.595	0.571	0.211

Table 5: Natural Capital

Natural	land	land less HH	0.031	0.04	0.04
		less land	0.96	0.74	0.23
		HH unirrigated land	0.96	0.92	0.64
		HH near to forest area	0.51	0.3	0.18
		wild animal attack	0.8	0.5	0.423
	Vulnerability Index : Land		0.652	0.5	0.3026
	forest	HH deriving firewood from forest	0.7	0.61	0.175
		average time to fetch firewood	0.692	0.692	0.077
		HH reporting declining NTFPs	0.8	0.8	0.8
		HH reporting declining wild edible greens	0.52	0.7	0.33
		forest encroachment	0.838	0.837	0.838
		Incidents of forest of forest fire	0.75	0.75	0.75
		land alienation	0.743	0.571	0
	Vulnerability Index : Forest		0.720	0.708	0.424
	water	HH reporting drinking water shortage	0.36	0.4	0.4
		average distance (time) to nearest to nearest drinking water source	0.102	0.081	0.0816
		depth of bore wells	0.167	0.166	0.167
	Vulnerability Index :Water		0.209	0.216	0.216
	climate variability and natural disasters	landslides during last 30 years	0.666	0.666	0.666
		droughts during last 10 years	0.333	0.333	0.333
		mean standard deviation of daily mean average maximum temperature by month	0.518	0.518	0.518
		mean standard deviation of daily mean average minimum temperature by month	0.433	0.433	0.433
		mean standard deviation of daily precipitation by month	0.440	0.440	0.440
	Vulnerability Index : Climate variability		0.48	0.48	0.48
Natural Capital Vulnerability			0.558	0.515	0.374

HH –Households, inv- inverse index, MPCE-Monthly Per capita Consumption Expenditure.

5.9 References

Adger, W. N. (2006). Vulnerability, *Global Environmental Change*, 16(3), 268–281, http://doi.org/10.1016/j.gloenvcha.2006.02.006.

Adger, W. N., Barnett, J., Chapin, F. S., & Ellemor, H. (2011). This Must Be the Place: Underrepresentation of Identity and Meaning in Climate Change Decision-Making, *Global Environmental Politics*, 11(2), 1–25. http://doi.org/10.1162/GLEP_a_00051.

Arpke, H., Kunze, I., Betz, L., Parameswaran, P., T:R, S., & Padmanabhan, M. (2013). Resilience in Transformation: A study into the Capacity for Resilience in Indigenous Communities in Wayanad, *BIODIVA Briefing Note 2*, Hannover, Germany.

Betz, L., Kunze, I., Prajeesh, P., Suma, T. R., & Padmanabhan, M. (2014). The Social-ecological Web: a Bridging Concept for Transdisciplinary Research*, Current Science* (00113891), 107(4).

Bookchin, M. (1996). Toward an Ecological Society, Montréal , Buffalo Black Rose Books.

Boyce, J. K. (1994). Inequality as a cause of Environmental Degradation, *Ecological Economics*, 11(3), 169–178.

Boyce, J. K. (2002). *The Political Economy of the Environment*, Cheltenham, U.K. and Northampton, Edward Elgar Publishing.

Chambers, R., & Conway, G. (1992). *Sustainable Rural Livelihoods: Practical Concepts for the 21st century*, Institute of Development Studies (UK). Retrieved from http://opendocs.ids.ac.uk/opendocs/handle/123456789/775.

Chemmencheri, S. R. (2013). Decentralisation, Participation and Boundaries of

Transformation: Forest Rights Act, Wayanad, India. *Commonwealth Journal of Local Governance,* 12(0). http://doi.org/10.5130/cjlg.v12i0.3264.

C.M; Sivadasan, P., & Kumar, N. A. (2003). Ethnobotany of Religious and Supernatural Beliefs of Kurichya of Wayanad District, Kerala, India, *indianmedicine.eldoc.ub.rug.nl*, 15:, 11–19.

Damodaran, A. (2010). Encircling the Seamless: India, Climate Change, and the Global Commons, Oxford University Press, USA.

DFID. (1999). *Sustainable Livelihoods Guidance Sheets*, London, Department for International Development.

Fisher, S. (2014). The Emerging Geographies of Climate Justice, *The Geographical Journal.* Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/geoj.12078/full.

Forsyth, T., Leach, M., & Scoones, T. (1998*). Poverty and Environment: Priorities for Research and Study-an Overview Study*, prepared for the United Nations Development Programme and European Commission. Retrieved from http://eprints.lse.ac.uk/4772/1/Poverty_and_environment-priorities_for_research_and_study.pdf.

Gaetaniello, A. (2013, December). How are Climate Change Challenges Impacting Agro-Ecosystems and Rural Livelihoods? A Case Study from India on Adaptation Applying a Transdisciplinary Approach, Msc Thesis, Global Change Management Faculty of Forest and Environment Eberswalde University for Sustainable Developmen, Eberswalde, Germany.

Gaetaniello, A., Nagabhatla, N., Shreejaya, S., & Prasad, D. K. . (2013). What are likely Influences of Climate Change on Land Use Change, Agrobiodiversity and Livelihoods? A case study of Wayanad Agro-ecosystem in Kerala, India,

Presented at the *Green India: Strategic knowledge for combating climate change: Prospects & challenges (GISKCCC-2013)*,Pondicherry.

Hahn, M. B., Riederer, A. M., & Foster, S. O. (2009a). The Livelihood Vulnerability Index: A Pragmatic Approach to Assessing Risks from Climate Variability and change—A case study in Mozambique, *Global Environmental Change*, 19(1), 74–88. http://doi.org/10.1016/j.gloenvcha.2008.11.002

Indian Institute of Management (IIM). (2006). Wayanad Initiative: A Situational Study and Feasibility Report for the Comprehensive Development of Adivasi Communities of Wayanad, Kozhikode, The *Indian Institute of Management—Centre of Excellence*. Retrieved from http://www.scribd.com/doc/4074255/Wayanad-Initiative#scribd.

Kumar, D., & Srinath, P. (2011). Climate Trends in Wayanad: Voices from the Community, Presented at *the Recent Trends in Climate & Impact of Climate Change on South-West India'*, St. Joseph's College, Devagiri, Kozhikode, Kerala. Retrieved from http://goo.gl/VC7r4.

Lamichhane, K. (2010, August). Sustainable Livelihood Approach in Assessment of Vulnerability to the Impacts of Climate Change: A study of Chhekampar vdc, Gorkha district of Nepal, Thesis,B:A, Kathmandu. Retrieved from http://www.forestrynepal.org/images/thesis/Thesis%20Final.pdf.

Lax, J., & Krug, J. (2013). Livelihood Assessment: a Participatory Tool for Natural Resource Dependent Communities, *Thünen Working Paper; 7*,Braunschweig: Thünen Institute, Federal Research Institute for Rural Areas, Forestry and Fishery http://doi.org/10.3220/WP_7_2013.

Logan, W., & William, L. (2000). *Malabar Manual* - 2vols. New Delhi, Asian Educational Services.

Malone, E. L. (2009). Vulnerability and Resilience in the Face of Climate Change: Current Research and Needs for Population Information, *Battelle Memorial Institute*,Washington, PNWD-4087.

Marino, E., & Ribot, J. (2012). Special Issue Introduction: Adding Insult to Injury: Climate Change and the Inequities of Climate Intervention, *Global Environmental Change*, 22(2), 323–328. http://doi.org/10.1016/j.gloenvcha.2012.03.001.

Münster, D., & Münster, U. (2012). Consuming the Forest in an Environment of Crisis: Nature Tourism, Forest Conservation and Neoliberal Agriculture in South India, *Development and Change*, 43(1), 205–227.

Nagabhatla, N., Sahu, S. K., Gaetaniello, A., Wen, L., & Lee, W. (2014). Understanding Impacts of Climate Variation in Varied Socio-ecological Domains: A Prerequisite for Climate Change Adaptation and Management. In W. L. Filho (Ed.), *Handbook of Climate Change Adaptation* (pp. 1–25), Springer Berlin Heidelberg. Retrieved from http://link.springer.com/referenceworkentry/10.1007/978-3-642-40455-9_64-1.

Naidu, S. C., & Panayiotis, T. M. (2010). Primary Accumulation, Capitalist Nature and Sustainability, *Economic and Political Weekly*, Vol 29. Retrieved from https://www.academia.edu/4117078/Primary_Accumulation_Capitalist_Nature_and_Sustainability.

Nair, K. N., Vinod, C. P., & Menon, V. (2007). Agrarian Distress and Livelihood Strategies: A Study in Pulpalli Panchayat, Wayanad District, Kerala, *Centre for Development Studies*. Retrieved from http://opendocs.ids.ac.uk/opendocs/handle/123456789/3101.

Nandakumar, T. (2014, March 20). Four Districts Categorised as Climate Change

Hotspots, *The Hindu*, Thiruvananthapuram. Retrieved from http://www.thehindu.com/news/national/kerala/four-districts-categorised-as-climate-change-hotspots/article5801125.ece.

Padmanabhan, M. A. (2005). Institutional Innovations towards Gender Equity in Agrobiodiversity Management: Collective action in Kerala, South India, CAPRi Working Paper 39. Retrieved from http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/125203.

Rao, G. S. L. H. V. ., Rao, A. V. R. ., Krishnakumar, K. N., & C.S, G. (n.d.). (2009) "Impact of Climate Change on Food and Plantation Crops in the Humid Tropics of India" ISPRS Archives XXXVIII-8/W3 Workshop Proceedings: Impact of Climate Change on Agriculture, 127-130.

Resilience dictionary - Stockholm Resilience Centre. (2007, December 26). Retrieved May 21, 2015, from http://www.stockholmresilience.org/21/research/what-is-resilience/resilience-dictionary.html.

Ribot, J. C. (2009). Vulnerability does not just Fall from the Sky: Toward Multi-scale Pro-poor Climate Policy. In R. Mearns & A. Norton (Eds.), *Social Dimensions of Climate Change: Equity and Vulnerability in a Warming World*, Washington, DC: The World Bank. Retrieved from http://www.icarus.info/wp-content/uploads/2009/10/Ribot-Vulnerability-Final-Draft-for-Distribution.pdf.

Santhoshkumar and, A., & Ichikawa, K. (2010). *The home gardens of Wayanad*. Retrieved May 21, 2015, from http://infochangeindia.org/agenda/agricultural-revival/the-home-gardens-of-wayanad.html.

Schlosberg, D. (2004). Reconceiving Environmental Justice: Global Movements And Political Theories, *Environmental Politics*, 13(3), 517–540.

http://doi.org/10.1080/0964401042000229025.

Schlosberg, D. (2012). Climate Justice and Capabilities: A Framework for Adaptation Policy, *Ethics & International Affairs,* 26(04), 445–461. http://doi.org/10.1017/S0892679412000615.

Shrivastava, A., & Kothari, A. (2012). *Churning the Earth: the Making of Global India,* New Delhi , New York, Penguin.

Srinath, P., & Kumar, D. (2012). Adapting to Climate Change and Variability in an Agro-forestry Region in South India, Presented at the *International Conference on Public Policy and Governance, Bangalore*.

Tanner, T., & Allouche, J. (2011). Towards a New Political Economy of Climate Change and Development, *IDS Bulletin*, 42(3), 1–14. http://doi.org/10.1111/j.1759-5436.2011.00217.

Véron, R. (2001). The "New" Kerala Model: Lessons for Sustainable Development. *World Development,* 29(4), 601–617. http://doi.org/10.1016/S0305-750X(00)00119-4.

Vishnudas, S., & Munster, U. (2012). In the Jungle of Law, *Economic and Political Weekly*. Retrieved from http://www.epw.in/insight/jungle-law.html

Wisner, B., Blaikie, P., Cannon, T., & Davis, I. (2003). *At Risk: Natural Hazards, People's Vulnerability and Disasters* (2nd edition). London ; New York: Routledge.

CHAPTER

6

Conclusions

Contents

6.1 Summary of Conclusions

The dissertation sought to analyse the environmental change dynamics in post- liberalisation India through the lens of inequality. It is broadly placed in the climate justice framework and contributes to the emerging body of work that understands environmental change "as a disparate set of changing ecological conditions and outcomes filtered through social and political economic conditions on ground" (Marino & Ribot, 2012, p. 6). It emphasizes the need for a rights based approach grounded on the premises of equity and equal access to a clean and safe environment for all individuals. The dissertation highlights the importance of taking into account intra-country inequalities for effective sustainability initiatives at the national level.

Chapter 2 sets the theoretical framework for the dissertation. The vicious circle relationship between inequality and environmental crisis is depicted here based on existing literature. Socio-economic inequalities trigger unequal distribution of the ecological space where the costs of environmental degradation are often passed on to the socio-economically marginalised sections of the socitey . The effects of environmental crisis are driven by the existing socio-economic relations and power structures. Thus fragile livelihoods are further impoverished by the environmental crisis. It also affects the sustainability of eco system based rural livelihoods creating new forms of inequalities as well as exacerbating the existing ones.

Chapter 3 depicts the questions of equity and carbon space sharing within India by focusing on the distribution of emissions across classes in post liberalisation period after 1990s. Based on household consumption

surveys the carbon dioxide emissions of various socio-economic classes in the country is calculated. The climate injustice parameter developed in this study establishes the appropriation of ecological space in the country by an elite majority. The results are quite contrary to mainstream approaches that see affluence as a key ingredient for sustainable development or that the poor are the major polluters. It establishes that elites in the country are the major polluters both in an absolute sense as well as in per capita terms, while the working groups tend to suffer from acute energy poverty, and are the least polluters. As India embarks on growth-accelerating policies, it is the urban elites that contribute almost fully to the increase in the inequality of emissions in the household sector. The empirical evidence presented here falls in line with Boyce's proposition that relatively wealthy and powerful benefit disproportionately from economic activities that generate environmental harm (Boyce, 2002).

In Chapter 4 a climate change resilience parameter is developed using a set of variables that have socio-economic and ecological significance. The results indicate that, there exists substantial inequalities in the resilience parameters of different classes and the urban elites are the most resilient and powerful group over the years. The resilience parameter of the urban elites and the agricultural labourers remain at both the ends of the spectrum with a value of +1.8 for the former and -1.5 for the latter in the year 2009-2010. A fall in resilience parameter value of the small peasants have been observed over the years 1993-1994 to 2009-2010 and the rural working group exhibited a negative resilience value in both the time periods. A comparison of the resilience parameter of the classes with their respective share of carbon dioxide emissions gives a clear evidence

of risk transfer where the benefits of high emissions rest with the elites while the ecological cost of emissions in the form of vulnerabilities associated with the climate crisis is passed on to the least polluters, who happen to be the rural working classes and small peasants.

Chapter 5 depicts the vicious circle relationship between inequality and environmental degradation with the help of a case study in Wayanad district of Kerala which typically represents the rural agrarian landscape in India subjected to multiple stressors. It outlines that vulnerability to environmental change does not exist in isolation from the wider political economy of resources used. The chapter establishes the causal link between crisis in socio-economic realms and climate change vulnerability, declining environmental quality and livelihood crisis of the marginalised groups. It has also highlighted the criticality of natural capital for rural eco-system based communities. Thus the vicious circle argument developed in the previous chapters is depicted clearly in this chapter using Wayanad as a case study. The central theme resonating in the chapter is that environment is expressive of social relations and hence it has to be upheld as a social justice issue.

6.2 Future Directions

In the broader context of the relationship between inequality and environmental degradation the dissertation articulates the nexus between inequalities and climate change dynamics in post reform India. The climate change dynamics in contemporary India at a household level is a largely unexplored terrain. However consumption decisions as well as adaptation measures begin from the household level and effective policy measures can emerge only by an understanding this phenomenon. The

third chapter has relied on national sample survey data to calculate the direct carbon dioxide emissions in the country. Household level study of emissions in the country is quite scarce. However this could be further expanded to take into account indirect emissions also and provide a comprehensive picture of the climate injustice in the country. It would also be interesting to see how consumption patterns with regard to various food and non-food items are evolving in the country. This could throw lot of insight into developing environment sensitive consumption patterns.

The fourth chapter on climate change resilience has been severely constrained by the lack of comprehensive data and hence the parameter is composed of very few significant variables. But it can serve as an outline to develop climate resilience parameters within smaller regions and localities. A comprehensive climate change adaptation policy should incorporate climate justice dimensions that include carbon equity also. Hence both the climate injustice parameter and climate resilience parameter can be used as potential tools to develop climate change resilience as well as in designing progressive climate change adaptation policies. The fifth chapter has depicted how the outcomes of climate change are filtered through the existing socio-economic scenarios. Hence further research should acknowledge equity as a fundamental requirement for sustainability and encompass not just bio physical conditions but ground socio-economic realities and power structures also.

The dissertation has also thrown light on the much ignored dimension in climate change research; intra country inequalities. As argued earlier questions on intra country inequality are largely unacknowledged in

climate change literature. Study of the nexus between intra country inequalities and climate change can add more meaningful dimensions to the climate justice literature as it lays the foundations for a just and equitable climate policy .

6.3 References

Boyce, J. K. (2002). *The Political Economy of the Environment*, Cheltenham, U.K. and Northampton, Edward Elgar Publishing.

Marino, E., & Ribot, J. (2012). Special Issue Introduction: Adding Insult to Injury: Climate change and the Inequities of Climate Intervention. *Global Environmental Change*, *22*(2), 323–328. http://doi.org/10.1016/j.gloenvcha.2012.03.001